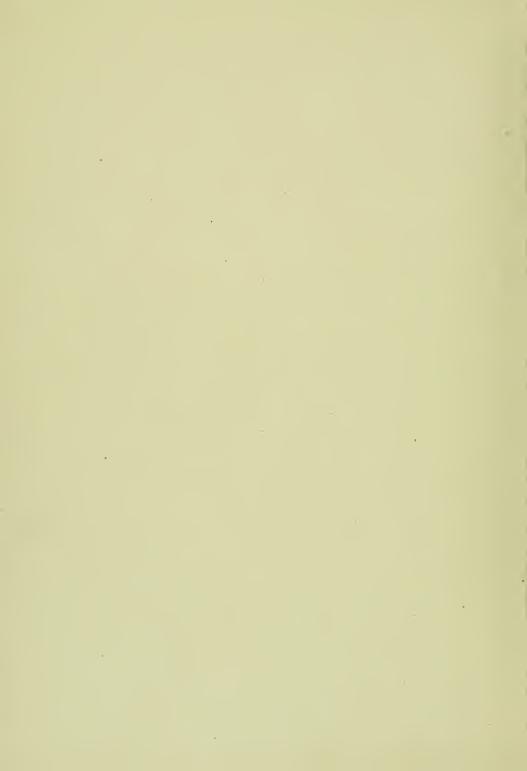
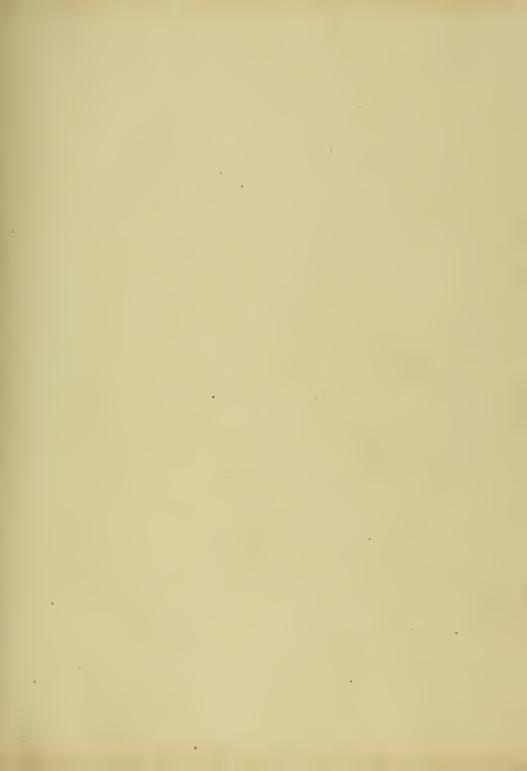
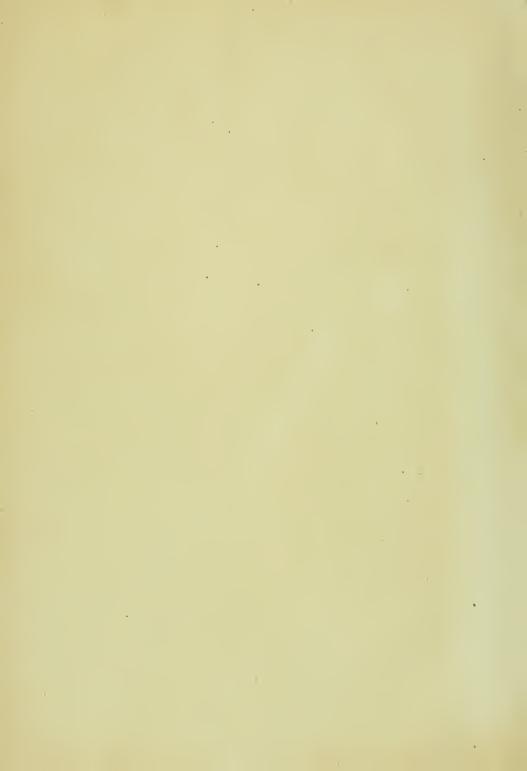
HISTORY OF AMERICAN TEXTILES











History of American Textiles

WITH
KINDRED AND AUXILIARY INDUSTRIES
(Illustrated)



A Popular and Accurate Historical Account of the Growth and Development of the Making of American Fabrics
Accompanied by Sketches and Illustrations of the Men and Establishments that
Have Made One of the World's
Greatest Industries

Edited and Published by the Staff of the

American Wool and Cotton Reporter

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ROM time immemorial, next to the raising of grain and of animals for food purposes, the spinning and weaving of fibres for the manufacture of clothing has been the most important work in which man has engaged. From many points of view the textile industry equals the importance of the former, for food and clothing are both essential for the maintenance of life in our clime. The story of the invention of machines and of different processes that have made possible the present extent and variety of manufacture contains threads of romance equal to any tale ever spun of human endeavor; and each time it is retold new facts and new elements are discovered.

War tested American textile resources, as they never were tried before. This is a story within itself and its preservation is a duty the textile press owes to its public. From panic has emerged commercial supremacy. From fear we have arrived at a faith which is producing and marketing unparalleled quantities of goods from an hitherto unbelievable number of plants. Success was not accidental; it came because American brain and sinew went out and gathered it in. This is a new story and the men and firms who have played their respective parts in the upbuilding of this world industry must be chronicled and the telling of this romance of the modern business world cannot longer be delayed. The future of the textile industry holds wonderful possibilities and there are none today who dispute its premier position among the greatest in the country.

Probably no other industry has depended for its great expansion so much upon the invention of machinery and upon the discovery of various processes. The rewards have been magnificent, but this development did not have its real beginning until the last years of the 18th century. The names of the men whose ingenuity and persistence have made possible the perfection of the wonderfu machines which today are considered an everyday feature of a textile plant, represent individuals who in ability and character rank among the greatest in the commercial history of America; and there are the men who financed these enterprises, when success was uncertain and without whose encouragement, judgment and foresight, the inventions and various processes would have come to naught; and without the organizers and manufacturers the great textile combinations of today would have been impossible; the improvement in mill construction and in the manufacture of various devices for bettering conditions in mills, have been

important factors; the greater availability of power for running the mills presents a most interesting study; the selling houses whose organizations have made possible the distribution of products all over the world is another phase of intense business interest.

The intention of this publication is to present in a most fascinating manner, by narrative and biography, leading facts in the lives of the men who have made possible the marvelous development in these varied branches today; and most of all, it is desired to demonstrate how much the country owes to this wonderful industry and to the men who are at the forefront in its affairs; to show how these mannfacturing establishments, located in every state in the Union, take the raw fibres, and by efficient organizations, highly developed machinery and skillful operatives, transform them into woven and knitted fabrics to be distributed throughout the world.

But the men and mills of the textile industry have more than utilitarian importance. Wherever there is a textile mill there is a community which, in many cases, owes its superior educational advantages and improved living conditions to the interested cooperation of the mill management. The textile mill offers employment to many immigrants who are not only taught a trade but are provided with schools for their children and with better social and living conditions for themselves, and in the end they become better citizens. Many towns and cities and many men and women owe their development and position in the world to the efforts of the men who established a textile mill in their locality, and who worked to build up a prosperous organization and took a personal and financial interest in the civic development of the town and in the welfare of its employes.

An analysis of figures of the textile industry as a whole makes it very plain that in its contribution to the lite and well being of this country it holds first rank. If this work of ours can at all help toward obtaining the credit which is due to it for what it has done and is still doing for the development of our national life, by showing the reader how much he personally owes to the men who have built it up as well as to those who continue to carry it on, then we shall feel that our efforts have not been in vain.

The merits of the work must be left for our readers to pass upon. We have concentrated the knowledge of thirty-five years of textile journalism within its pages. We have tried to embrace facts therein that would demonstrate the affection the industry holds within our hearts. To us it is like a child which has grown from the tender days of youth to the sturdy independence of manhood and we are so proud of the story which the years have produced that we write and dedicate it for the world to read and preserve.



Summary of Chapters

CHAPTER I.		CHAPTER VIII.	
General review of the industry for 300 years	Page 9	The reworking of wool and cotton. Textile substitutes in the modern	Page
		market	77
CHAPTER II. Early machines and appliances, hand looms, etc. Pioneer manufacturers and their products	18	CHAPTER IX. The marvelous products of the carpet mills of America	89
CHAPTER III.		CHAPTER X.	
Original American mills and their founders	26	Spinning the yarns. Development of the process	101
CHAPTER IV.		CHAPTER XI.	
Inventors, inventions and improved processes. Introduction of power and auxiliaries efficiency	37	Knit goods and the vast number of mills manufacturing this product	103
OLIA PETER AL		CHAPTER XII.	
CHAPTER V. The great cotton industry of the United States. Growth of manufac- turing and the plants devoted to cotton weaving. Selling and mar-		The tremendous growth of the silk industry in America. Sericulture and the mulberry tree boom. Manufacturers of the fabrics and their methods	107
keting of the products of the cotton mills	42	CHAPTER XIII.	
CHAPTER VI. Development of the woolen and wors-		The development of the domestic dyestuffs industry	114
ted industries. The making of the fabrics	52	CHAPTER XIV. Commission houses and selling agencies	130
Cotton and wool resources of the United States. Harvesting and marketing of these products	56	CHAPTER XV. Magnitude of the textile industry in America	126
			136
FELT The origin, construction, uses, types,		Leaders in the industry138	-424
styles of felt, and the development of the felt manufacturing industry	69	Complete Index to Contents will be found on Page 425.	



CHAPTER ONE

1620 - 1920

GENERAL REVIEW OF THE INDUSTRY FOR 300 YEARS

In the early days of the country the textile industry was a home industry firmly rooted in the colonial kitchens of the individual families. In England, skilled weavers had established themselves in settlements and all classes united in promoting their welfare and protection. Her laws were constructed and her privileges granted to redound to the commercial glory of the mother country. To this end, the English colonies in America were discriminated against or favored as expediency urged. Hardly a town of this period but bears witness in its Mulberry street of the English desire to wrest the silk trade from France. As early as 1616, the mother country urged Virginia to abandon her tobacco crops for experiments in silk culture. Lavish bounties were offered for the silk and dull threats of penalties for failure to plant mulberry trees were established. Silk was oc-casionally sent to England to be made into garments for the queen as evidence of good faith. Virginia struggled on for forty-seven years in an effort to please both England and the Colonial Assembly until the bounties were finally abandoned in 1666 and no incentive remained. The interest in silk culture had been aroused, however, and other states, stimulated by the same methods, attempted its production with varying degrees of success up to the time of the Revolution. The war, however, true to form, interrupted all but the most necessary production and the cultivation of silk was abandoned temporarily.

At the close of the war, American persistency again attempted to force the silk industry to the fore as a lucrative source of income. In 1829 new English methods of reeling the thread were introduced that made silk textile production an unquestionable success in America. The same shrewd welcome to changing methods has come down through the centuries of the American textile industry and successfully compassed the journey from the hand spinning wheel and colonial loom to the new

power machinery at the same time that the country expanded internally.

The first number of the Boston Transcript, issued July 24, 1830, bears witness to Massachusetts' interest in the silk industry in an advertisement which reads:

Five Thousand Silk Worms

Silk cocoons, Silk Worms' Eggs, etc. May be seen at No. 5 Tremont House. Also the process of the separation of the silk from the balls by reding, and much curious and useful information obtained relative to the hatching and rearing of silk worms and production of raw silk.

worms and production of raw silk.

Admittance 12½ cents. Children half price.
Season tickets, 50 cents.

Evidently, enough interest was contemplated to warrant issuing season tickets so that the life span of the silk worm might be followed.

Since the sericulture crash in 1844, described in a later chapter, the industry has been carried on with varying success in this country, including an attempt on an extensive scale in California in 1854. It was fostered by the government, even as late as 1901, but America, though with reluctance, finally abandoned the cultivation of the silk worm, chiefly because of the high cost of labor that must compete with the lower cost on the Continent and still cheaper labor in the Orient. Silk textile production, nursed by the determination of the pioneer, forged to the front, however, and the descendants of the early growers hold this production supreme in the world's history today though we import all our raw material."

In colonial days, silk was the only textile industry in this country encouraged by England. As staples for domestic use the colonies depended on flax and wool and somewhat later on cotton. England considered cotton a decorative garden plant and the English colonies at first accepted her prejudices. But when it was imported

^{*}Some authorities believe China may outdistance the United States, though her records are not accurate.

to the colonies from Barbadoes the need of any textile for clothing was so acute that the colonist took a chance in adapting it to his needs and his chance was so successful that he soon competed with India in muslin production.

The crying need of the home producer was for flax and wool. Flax was so scarce and so tedious to grow that the Colonial Assemblies fostered experiments with hemp after the custom of the Indians. In spite of these attempts nothing could be done with it as a fabric while cotton was experimented upon with such favorable results that the Whitney gin for separating the seed from the fibre found the market for the raw product already open.

In the production of wool, England experienced the sharpest clash with the col-onies. Influential men in America were determined to raise sheep for their wool to be made into clothing for domestic use. In retaliation England turned the flood of her protective policy on preventive methods forbidding the importa-tion of both men and machines into and the exportation of woolen goods from the colonies or even transportation between themselves. Throughout the early history, constant effort was in vogue to import sheep into the colonies. As late as 1802, the United States minister to Spain shipped the first merino sheep from that country to the weavers' colony at Derby, Connecticut. They were sold to the farmers at one hundred dollars a head. These sheep, it is asserted, greatly improved the American stock.

So strenuous was the struggle for raw materials in this colonial history, that the pioneer was forced to resort to skins for protection. England appeared to be having things pretty much her own way, but she was constantly arousing political antagonism in an otherwise peaceful colony. Coupled with this antagonism was a growing confidence in pioneer production and makeshifts, where necessary, that culminated in the Revolution. Production at this period was accomplished in the family largely by the women. When the war came, the women continued to spin and weave, so that the Revolution was fought and won without undue hardship on the part of the rebels in securing their clothing.

At the close of the struggle for freedom from British rule, however, post-war restlessness set in. Home production slackened and a period of real need of textiles began. This need was anticipated by the most advanced statesmen and satisfied by the encouragement extended to importers of textile machinery and workers. It was a period of extreme uncertainty fraught with unknown dangers to the new nation. Such men as Washington, Franklin and Coxe, in their constant guardianship, agitated the necessity for industrial progress and independence and paved the way for men like Samuel Slater to bridge successfully the perils of unknown industrial readiustments.

Party leaders, during this second period of American textile development were divided as to the destiny they would welcome for the new nation. The people at large divided with them into agriculturists and manufacturers. The agriculturists deemed it wiser to develop the country internally and attempt to produce food stuffs in sufficient quantities to exchange with England and Europe for manufactured articles. The manufacturers felt that there was a serious obstacle to the progress of the young republic unless it was economically independent, though the returns would not be so immediate. Thomas Jefferson stood between the two parties in an effort to reconcile them and to prevent the federal government from becoming a class covernment.

The earliest tariff laws beginning with the first, passed on Independence Day, 1789, were revenue taxes and so continued until 1816. The people at large were afraid of taxation because of their late experiences with England. Moreover, production was largely a domestic occupation and the requisites of a tax in the minds and words of the early citizens of the republic were "for the duty of supporting the government," "the discharge of the public debt," and finally, "for the encouragement and protection of manufacturers. In 1807 the federal government prohibited American ships from engaging in foreign commerce because of the controversy that arose between us and England and France over the blockade orders issued by those countries in the Napoleonic Wars. In 1809 the law was restricted to com-merce between England or France and America. This condition isolated America and both shipping and agricultural interests were consequently at a standstill until after the Treaty of Ghent.

Before the dawn of a new century, interstate duties had been abolished, all the new English machines had been established in this country, the cotton gin, of inestimable value to the South, had been invented, and manufacturing settlements had sprung up throughout the country. The young states still clung tenaciously to home production, however, and in 1803 there were only four small cotton factories in the North and none in the South. The War of 1812 loomed on the horizon and importation of necessities decreased, throwing the nation again on its own resources for textiles. Unsettled conditions had greatly interfered with the fishing and shipping industries. New England capital was shifting to the new factories with the result that in Massachusetts thirty manufacturing plants opened

mulated and the country expanded at the same time through turning agricultural? England and Europe meanwhile, were attempting to recuperate from the Napoleonic Wars. Large numbers of army men were thrown back into civil life. All the countries of Europe attempted to support home industries by protective tariffs, at the same time flooding the American market with their merchandise. Unsettled conditions throughout Europe and lack of employment caused hungry, skilful textile workers to throng the shores of America. They brought



American Indian Spinning Yarn from Wool of Sheep Raised by the Navajo Tribe (Photograph by George R. King)

in 1814 in a territory where only fifty had been previously established. The woolen output was quadrupled in the five years between 1810 and 1815.

Adventurous spirits, drawn by the opening of transportation facilities, were headed westward, with the concomitant new internal textile market. Things looked prosperous for the young textile industry when in 1815 England began to unload on the United States her textiles stored through the Napoleonic Wars. Public opinion wavered again. Food was the crying need throughout the world and the West was reaching open hands for eastern capital. Why struggle with manufacturing vicis-situdes when riches could be quickly accum-

with them reports of high, effective English tariffs.

The infant industries in this country needed and desired protection. The expenses of establishing an industry are heavy and if it must compete with cheap foreign labor at the same time, the industry will sink. The War of 1812 had encouraged activity in the textile pursuits and they had become of real value to the nation. Protection would be temporary only and could be abandoned when the industries had outgrown the critical years of infancy. These were the arguments pressed by the manufacturers to establish the tariff of 1816. With this began the American system of tariffs that hastened the outbreak of the

Civil War. The first one placed a twentyfive per cent tax on cotton and woolen goods that could be produced here and a twenty per cent tax on goods that could not be supplied entirely by the American industries. Still lower taxes were placed on the goods of foreign origin, the manufacture of which it would be impossible to duplicate in this country. The South and West at this time stood for protection because they produced the raw cotton and wool. If manufacturing in this country could be made sufficiently attractive to encourage capital, the market for the raw materials was at their door. New England opposed it in the interests of her shipping industry so a pacification clause was added putting a heavier tax on goods imported in foreign ships than in domestic ones. England's market meanwhile was overstocked and she prevented the hoped for results by selling her goods at an advantage in auction lots. The American policy was defeated. Financial distress resulted and the manufacturers called for a still higher tariff. The South united with New England against it. They were weary with the high prices and welcomed a change in policy. The West was able to establish a permanent tariff policy although unable to push it up until 1824 when thirty-three and one-third per cent was voted.

The high tariff induced men to put their money into manufacturing plants and throughout New England factory towns sprang up along the water-ways. The new West called again and again for manufactured goods in an ever increasing demand. The flow of foreign immigration to America had set in, and furnished not only hands to run the mills but a second market for fabrics of cotton and wool. The market without recourse to foreign exportation seemed limitless and over-production resulted. The woolen interests, threatened with a collapse, called a convention at Harrisburg, Pennsylvania, in the summer of 1827. The convention represented the large sheep-growing in-terests of the West that had developed with the new country together with the manufacturing interests of the Eastern and Middle States. The South alone was unrepresented since its interests were entirely at variance. The delegates to the Harrisburg Convention, with an earnest faith that they represented the interests of the majority of the country, recommended a higher and more effective tariff, and the first mutterings of southern dissatisfaction rumbled through the southern press and platform. Protection was made the issue of the forthcoming presidential campaign. Through political mismanagement of the campaign an unfortunately large tariff was inaugurated in 1828. Hard times either directly or indirectly resulted and a gradual reduction of the high tariff was begun in 1833 that resulted in a protective tariff of twenty per cent on textiles ten years later.

During the decline of the tariff, 1833 to 1842, a series of events occurred that revived interest and enthusiasm in textile manufacturings once more. The Erie Canal was finished in 1825. This revolutionized transportation. The passage of this compromised tariff of 1833 closed the protection controversy for some years. During the ten years of decreasing tariffs authorized by this legislation, each party to the dispute felt morally obliged to keep to the letter of the compromise. When the argument was again opened, the old animosity was greaty abated. The next animosity was greaty abated. The next recurrences were in 1846 and again in 1857, but industrial conditions had so changed that slavery was the absorbing, ominous interest and manufacturing protection temporarily took second place. The people at large were better versed in the use of tariff both for revenue and protection, and the bills regulating taxes were more skilfully handled.

Gradually the question of protection became the fundamental party issue in American politics. The Republicans adopted protection and high tariff for the fundamental plank in their platform. Democrats advocated low tariff and even looked forward to free trade. The necessity of upholding the national revenue remained, however, and taxes form an easy and large source of income. Consequently the changes are never so drastic as to repeat the panics and stringencies of our early tariff history unless some secondary source of depression is added to the tariff changes inaugurated by the conflicting party interests. The western pioneers saw their chance to get agricultural supplies out of the interior and manufactured goods in if a system of canals could be established. Where it had cost eighty-eight dollars to carry a ton of freight from Albany to Buffalo it now cost but six dollars and a half. The westerner's dream was bigger than the colonist's wildest speculation. It was for a foreign market for his raw products and a constant return of manufactured luxuries into his interior wilderness. With American decision, he set about accomp-

lishing the realization of his dream and in 1835, two thousand miles of canals were open to commerce and as many more under construction. Railroads were being built as adjutants to the canals though strangely enough in the twentieth century, the order is reversed and the canals become the rivals of the railroads, offering the advantage of lower rates to offset the hardship of slower passage. New appliances for textile machines had increased their efficiency. A vastly improved and low priced cotton gin was a valuable and time-saving aid in preparing cotton for the manufac-Textile mill shares were considered a profitable investment.

In 1836 our present system of patents was adopted. In the early history of the United States, statesmen interested in manufacturing were so eager to encourage the creative instinct that any applicant could gain a patent right regardless both of the worth and originality of the invention. This led to great confusion, and many lawsuits resulted since the patentee had no adequate protection. The law of 1836 provided for the appointment of a bureau authorized to issue patents after due proof had been offered both of their utility and novelty. While the inventor was perfecting his work, he could also protect himself by lodging a description of his patent at the bureau. This was called a caveat and was issued for one year. It restricted the grant of a patent letter to any other person for the same appliance. A library for the use of the bureau and an elaborate system of filing were also introduced. In this way even a laborer was encouraged to make improved appliances on a machine. No great invention resulted but minor provements were introduced. This developed the American system of interchangeable parts, placing American ma-chinery well in the vanguard in technical construction which establishes an economic gain in saving both time and risk. This early patent regulation remained in use until after the Civil War and is still the foundation of our modern patent system. Other countries have adopted it as an economic advantage to themselves but it was the comprehensive foresight of the Western World that planned it.

In 1837, a world-wide panic changed the flux of money once more from the industries in this country to the western lands. Europe was trying desperately to readjust her life after Central European Wars. Large numbers of soldiers returned to their homes, where no employment

awaited them. Tales of American resources encouraged a flood of immigration to our shores. Incidentally the lowering tariff delayed our market with English goods and large tracts of western land were thrown open to settlers at a dollar and a quarter an acre. Constantly in the opening up of America, territorial developments and economic expansion have



FRANCIS CABOT LOWELL

rivaled each other as a source of investment at the same time stimulating Herculean efforts on the part of their opposing advocates to fulfill the law of supply and demand. This new territory offered by the federal government in 1837 was accessible through the new systems of canals, so once again capital was deflected to agricultural pursuits.

An added source of disquiet was the instability of our currency. Many small factories submerged in the panic. The idea of centralization of manufacturing interests into large corporations for protection against a recurrence of such a panic originated at this time. The idea of consolidation was perhaps more the outgrowth of the original factory system in the United States than any real change in policy. In the expansion of the American textile industry two methods were pursued. Prominent statesmen at the close of the Revolution, with a sincere belief in fostering national economic independence, agitated the establishment and support of factories. They urged both the state and central governments to support these industries by granting bounties and privileges to the promoters. They counselled the public to support them on patriotic grounds. Beverly Cotton Factory, 1787; the Hartford Woolen Manufacturing Co., 1789; the Baltimore Cotton Manufactory, 1789; and the New York Manufactory, 1789, from which Samuel Slater journeyed to Pawtucket were among this type of factory. They were all unsuccessful, because the promoters relied on the sentimental foundation of patriotism and vague public policy rather than on a sound business method of organization, economy, and accessible water power. America, perhaps the most visionary nation in the world, has never sentimentalized with her work. dreams are goals, which she reaches by steady enterprise and consistent, skilful adaptation to necessity. Consequently, the successful factory system that developed later into the American corporation policy was the response to business necessity though patriotism was not discountenanced. It was the outgrowth of the early home in-

dustry of New England. Samuel Slater is called the father of the American cotton industry though per-haps some credit should be given to Moses Brown, his father-in-law. New England acumen and shrewdness in developing the English system and adjusting it to American economics is the underlying principle. Slater first attempted to foster the English apprenticeship system here. When it showed signs of being unsuccessful, he modified his ideas to the tendencies already established in this country. Moses Brown was the second generation of prosperous mercantile merchants. His family had dealt in the output of the home industry and he had established a factory of hand workers. Pride in his success and no doubt a patriotic desire to compete with the new English machines led Moses Brown to buy and experiment with any new textile machine that came to his notice. All his efforts were unsuccessful until Samuel Slater with his knowledge of English machines came into his employ. Slater successfully modelled and established the English machines, and with genuine American sympathy for achievement, Moses Brown admitted him to joint partnership with others of the Brown family. The company established mills in several New England towns. The machinery was fashioned like the English machinery; the functioning was carried on by whole families though women and children made up the majority of the employees. The welfare and education of the families was controlled by the mills to a great extent. All the processes of textile manufacturing were carried on under one roof. So successful were the Slater mills that the Slater method of organization became a recognized model

throughout the textile centers of this country.

A later and somewhat opposing system of organization was introduced by Francis Cabot Lowell in the Waltham Mills about twenty-three years later. This is the direct predecessor of the modern American textile system. The difference in the two systems was partly a difference in the machinery employed but more especially a complete variation in the executive system of the mill.

The owners were organized into a board of directors whose president acted as chairman and whose treasurer bought the raw material and sold the finished product. In the mill itself, the processes were so arranged that less time and labor were lost in performing them. The processes were subdivided into departments and the employees were engaged for specific work in a given department. Each group was organized under an overseer who reported to a superintendent. The superintendent reported to the board of directors, as did the master mechanic who had charge of the machines and buildings. The superintendents and overseers were required to be of such unimpeachable character that the daughters of the middle class families were quite willing to work under their direction. Boarding houses were erected by the mill and a matron was employed to further oversee the welfare of the girls. This system eliminated the work of children and families and the fact that wages were paid in cash rather than in merchandise at factory stores as in the Slater Mills did much to counterbalance the distress occasioned by a shut-down in the mills. This well-knit organization has continued to the present day in the manufacturing plants of America because it standardizes the output satisfies the employer, and the cost of production and profit can be readily computed.

Just before the Civil War, financial uneasiness, new methods of transportation, and the need of new machinery, led the manufacturers to desire some reorganization of business methods in order to raise large capital. It was discovered that the risk was less and that the incentive to buy stock in a large corporation was greater, so the tendency to corporate management had its birth just as the Civil War opened. In 1860 there were about 120,000 small manufacturing companies with an average capital of \$7,000. The panic of 1873 furthered the organization of "big money" interests and in 1900 the major part of the output of our manufacturers was controlled by

185 large companies with an average capital of fifteen hundred million dollars.

The economic value of these monopolies was the lowering of the cost of production because of uniform buying, the elimination of waste that previously resulted from excessive competition, the interchange of patent rights, and the utilization of byproducts. These benefits reacted to the advantage of the consumer in lowering the

united labor with them from across the water where the employees were paid lower wages and worked under far less comfortable conditions. The spirit of organization and method fostered throughout America's expansion no doubt encouraged this class organization of industrial workers.

Monopoly and labor opposed each other as the textile industries expanded until the guest World War overpowered and swept



Navajo Indian Woman Weaving a Blanket from Native Wool
(Photograph by George R. King)

selling price, and to the prosperity of the employee through increase in wages and improvement in his environment both during working hours and in recreation hours. Opportunity was offered for education, social pleasures and sick benefits. The small stock-holder also gained a safe investment for his surplus money. In opposition to this system arose the labor unions. The English textile workers brought ideas of

aside all minor differences. America can be justly proud of the response to her call to arms. Immigrant and native, laborer and capitalist, united in sacrificing personal ambitions and the advantages each had won until the nation was released from danger, and peace once more established. With peace came the usual post-war restlessness and the throngs of returning soldiers to readjust to civil life. As the

months roll by commerce swings into American ports while Europe struggles with her labor problem.

Once more the dream of world supremacy brightens the eyes of the American manufacturers and statesmen. True to colonial tradition in adjusting themselves to new methods, capital and labor are trying new experiments in team work. Neither labor nor capital can over-power America's industrial policy without self-destruction. Our native spirit of fair play must eventually prevail over the temporary turmoil occasioned by the late war, so great that monarchies fell and social structures throughout the world rocked to their foundations.

During the expansion of manufacturing interests, America was also stabilizing her coinage, expanding territorially and uniting the states into a strong central government that could take its place as a world power. The constant flood of immigration to the West opened up enormous tracts of land to American policies; at the same time it offered a home market for her manufactured goods. The discovery of gold in California made the United States one of the richest countries in the world and combined with her present system of coinage helped to stabilize her credit and bring her into prominence as one of the powerful nations of the world.

To a great extent America owes her advance to the peaceful conditions that prevailed during her territorial expansion and industrial growth. The Mexican War was short and its greatest evil was only temporary in its effect. It enlarged slave territory and thus widened the abyss between the

North and South.

As the North expanded industrially, the South turned to cotton growing to the exclusion of all other interests. The Civil War proved the necessity of industrial independence with a finality well nigh disastrous to the South. Not only was the war fought on southern territory, but the Confederate states were without means of supplying their own needs in manufactured articles. So great was the distress caused by the invasion and accompanying blockade that the South actually attempted to supply their needs for clothing by the reintroduction of the antiquated hand looms. They were defeated through no lack of courage or endurance, but because of their inability to compete with northern factories in supplying their needs. The manufac-turers, on the other hand, gained a new and enduring stimulation from the war.

The federal government bought uniforms and army equipment from them which not only added to their receipts but proved an incentive for investment. Industrial pursuits proved to be an economic necessity for safety to a growing nation. It was also discovered that men trained for work in a textile mill could be transferred readily to work on war equipment or even aptly respond to military training.

After the Civil War, the South was in desperate need of encouragement and help in reestablishing her life on a new economic footing. Some shifting of business interests again occurred and when conditions seemed to be approaching a normal level once more, the panic of 1873 broke. The most notable result of this panic was the rise of individual men in the industrial world who were called "kings of industry" or "frenzied financiers" according to the outlook of their reporters. These men furthered the interests of organization and monopolies already established before the Civil War, and American industry became a world power not easily overthrown or to be juggled. In 1860 the exports of American merchandise were valued at \$300,000,-000, of which textiles amounted to \$10,-934,796 and in one week in 1912 New York alone exported twenty-five million dollars' worth of manufactured goods.

From 1861 to Wilson's administration the country had a constant régime of Republican presidents with the exception of Grover Cleveland. Protective tariffs thus became known as a national institution. The South constantly opposed them. The old Civil War bitterness lurked in her creed for she felt that the federal government discriminated against her raw cotton and favored New England, her old time oppo-Under the protective tariffs, however, and with the call of necessity and the aid of northern money and experience cotton mills grew up throughout the South and today offer worthy competitors to the old established New England factories.

President Wilson, a Democrat, was the South's chosen leader. If the World War had not clouded the horizon, the tariff question would have arisen with new vigor, but the war itself acted as protection to the American industries, more effectively than the manufacturers at first desired. At the same time, the blockade interfered with the exportation of raw cotton from the Southern States to England. As in pre-war days, distress seemed once more to threaten disaster to the South through her dependence on agriculture. An effort to

support her cotton production was inaugurated in the "buy-a-bale-of-cotton" movement. Response was quick, for the whole country desired to smother the last trace of animosity smouldering since the Civil War, and stand united in sympathy as well as federally. When the United States entered the war, the new, growing factories of the South received the same productive stimulation that the older textile industries of New England experienced under war pressure. At the close of the war, North,

South, East and West were united as never before in full realization that so large a nation to gain the world market must support her own internal industries, both agricultural and manufacturing. The European market lies open to us and in the outlook for supplying it, Canada and the United States propose a joint construction of the Saint Lawrence and Great Lakes canal route, a matter which at the present writing is unsettled.



Amoskeag Falls, Manchester, N. H. Shows Amoskeag Plant in 1856

CHAPTER TWO

EARLY MACHINES AND APPLIANCES, HAND LOOMS, ETC. PIONEER MANU-FACTURERS AND THEIR PRODUCTS.

When the Puritan came to this country, he left behind him an England just awakening to the importance of the textile industry. Already in England, weavers' settlements were established, and the system of apprenticeship had dawned. Continental wars and religious persecution in France tended to shift the economic advantage to England. Weavers from the Continent had watched the quiet of England, and were beginning to settle in groups throughout that country and neighboring islands. In consequence, England had just outgrown the local guild organization, and was embarking on her system of

apprenticeship.

The Pilgrims brought with them the faith in attaining some day a textile development equal at least to England's, and independent of her. No great development, however, was reached prior to the Revolution. For the first hundred years in the new country, each household produced its own textiles, and the whole family was actively interested in providing food and raiment. The men raised the raw materials and built the textile tools that were too primitive to be technically called machines. The women prepared the raw materials and manufactured them on the home-made machines. As a rule, each town in its struggle to obtain food, supported a grist mill owned by a prominent citizen, who ground the corn for a percentage of meal. These mills were one story high and built of stone. In the next century, when copies of English textile machines were procured, a second story or loft, made of wood, was built on the grist mills, and the new textile machines installed in it.

In the seventeenth century, the demand for textiles was supplied largely in the household. Some were imported from England, but when we consider that a ship could make but two round trips a year, that there were few vessels carrying a hundred tons and that freight rates were proportionally eight times the modern schedule, we realize that English goods were negligible even before England's legislation against their importation to the colonies in 1685. Our mental picture of the colonial household occasionally centers

about a loom. Our favorite picture is Priscilla at her spinning wheel. When we learn that it required a considerable operation of the spinning wheels to clothe one adult comfortably, we may rightly suspect spinning was a frequent pastime, introduced by ne-

ccssity.

Before the colonial housewife could settle comfortably to her spinning wheel, the wool must be carded and the flax broken, swingled and hatchelled. Originally, the fingers were used to pull out the dirt and separate the The first acfibres into strands or slivers. cessory tool was made of bone to resemble a This was folhand that raked out the dirt. lowed by the hand card, used by the colonial It was made of two flat boards covered with leather or skin through which wire teeth protruded. The carder placed the wool between these boards and drew the right hand one towards her, thus combing through the fibres. When the wool was at-tenuated and soft, it was called a sliver and the worker rolled it into a soft fluffy bundle to place on her distaff and spin.

The preparation of flax was more compli-First the worker broke up the woody Second, she beat it with a long wooden knife called a scutcher to remove the woody particles. This was called swingling the flax. Lastly, the flax was hatchelled or combed. The comb was made of a long flat The comb was made of a long flat

board, set with spike-like teeth.

Spinning was the second process in the long tedious task of fabric-making. The household spinners used two wheels, the wool wheel called the "great wheel" in the colonies and a smaller flax wheel. The types of tools were the same as those used in England and on the Continent under slightly different names. The "great wheel" was called the "Jersey wheel" in England, and the "Muckle wheel" in Scotland. The flax wheel was called the "Saxony wheel" or sometimes the "Leipsig wheel." Both wheels were the products of the fourteenth and fifteenth centuries, and had come down through the ages with only slight changes. Through the early centuries there had been no incentive to greater and faster production. It had been a vision of finer yarns and more beautiful fabrics that aroused the artisans to a competition of skill. The necessity and development of the rapid production of the machine age burst upon the world so suddenly, that even today we have isolated women in our country who were brought up on the "great wheel" and the "flax wheel," and their fingers twitch and eyes glisten when they recall the hope chest of their girlhood filled with their own handicraft.

The "great wheel" of the colonial days was truly a great wheel, set in a three legged frame or base that supported two upright sticks which held the spindle in a horizontal position. The spindle was connected to a small wheel by a pulley, and the small wheel in turn was connected with the big wheel opposite by a band. The spinner held the roll of soft carded wool, from which she drew a sliver. She twisted the sliver in her fingers and attached it to the spindle. Still holding the roll in her left hand she struck the large wheel with her right hand or stick. As the great wheel revolved, the small wheel turned rapidly and caused the spindle to whirl, carrying with it the attached sliver. The spinner drew the roll away from the spindle at right angles to it, frequently walking away from the wheel to gain a greater length in the yarn. It is said that she sometimes walked twenty miles a day in wool spinning. When the roll was nearly drawn out and twisted, the spinner stopped the wheel, and turned it in the opposite direction, slowly, in order to force the spun varn to the center of the spindle. Then the wheel was turned again in the original direction until the spun yarn was wound on the spindle. The end of the length of spun yarn was then laid under the new sliver and the process repeated. In the great wheel" spinning there were two distinct operations performed alternately by the wheel; first, the attenuation and twisting of the fibre and second, the winding of the spun

The flax wheel was invented at least a century later than the "great wheel" in 1530 by a German named Jergen. The advantages over the "great wheel" were that the operations of drawing, twisting and winding were done simultaneously; the distaff was attached to the frame above the spindle; and the motive power was the foot leaving the hands free to guide the thread. The frame was the same three-legged standard with the wheel at one end lower than the distaff end. At the distaff end, the spindle was supported in its upright bars. The steel spindle was like a needle. The point protruded through a leather ring attached to the

bar farthest from the spinner and the eye passed through a second leather ring attached to the bar nearest the spinner. A pair of arms called a flyer was fastened near the needle's eye. The thread passed over this flyer to the bobbin and was set with several hooks over which the spinner guided the yarn so that the bobbin would fill evenly throughout its length. The flyer derived its name from the rapidity with which it revolved, but the bobbin moved more slowly as the spinner let out the yarn to make it coarse or fine. The bobbin fitted loosely on the spindle and was attached by a cord to the wheel as was the spindle. A handle was attached to the standard on which the parts turned, tightened or loosened the wheel band that connected with the spindle and bobbin. Below the frame was the treadle connected to the wheel by a rod. of flax was most carefully laid about the spindle in parallel smooth lengths, and tied loosely with a ribbon. The spinner now sat at the wheel and passed the flax with her right hand from the distaff to the eye of the spindle. The left hand opened the fibre on the distaff so that it would run smoothly to the eye of the spindle and thence on over the hooks to the bobbin, always guided by the spinner's right hand. Beginners found it difficult to keep the wheel revolving at the same time they used their hands for smoothly attenuating the varn.

Many of the early Puritans had the advantage of skilled training in spinning in Holland. Some professional spinners and weavers came with the first settlers. Others followed, induced by the glowing possibilities of a new country, until England passed a law, repealed in 1824, restricting the emigration of textile workers to America. With the establishment of a new country, however, the second generation had much to occupy it, and they spun less well than the original settlers who had been under Dutch influence. Their efforts were turned to the adaptation of their lives to a new, rigorous climate. fathers had come here seeking not only religious freedom but economic development. They expected to depend on England for many supplies, and in return to sell England skins, furs, and fish oils. They had intended to remain loyal subjects to England, but the English government, with criminal lack of foresight, both neglected the needs of the young colony, and restricted trade oppor-tunities even between the colonies them-

The result was a mental development and adaptation to environment, that has descended through the pages of American history today under the well known name of Yankee wit and shrewdness. It was the Yankee wit that introduced birch bark under shingles to keep out the cold and snow. This later developed into the industry of building or roofing papers. Again, the early colonist learned to bank clay about his house supporting it with clay-boards now known as clapboards. He built doors on his pews in church and invented countless small comforts, or necessities, if we consider the northern climate. New means of making himself comfortable occupied him somewhat to the disparagement of extremely fine spinning, though he never lost the higher vision of what the new settlement must accomplish in the world's work. It was here that he tried out the first experiments in local self-government and the written ballot. It was in this bleak seacoast settlement that church and state were definitely separated and free education and the embryo trade schools received their initial impetus. The colonist groped dimly towards an economic independence and advancement that he himself only half understood. His ideals have descended to the United States of today, a legacy rich in possibilities both for the individual and the nation. His ideal of economic development colored the early textile history of the country. The history and the textile development intertwine like the warp and weft of a fabric. The fabric is American civilization and the pattern is traced by American politics in the background of the American textile industry.

The laws to encourage spinning in Massachusetts are typical of the endeavor made by all the colonies to promote home industry and make the country independent of English laws and imports. In the spring of 1640 provision was made to canvass the towns to discover what was available, what men and women were skilled in textiles, what were the means for manufacturing and producing both raw materials and textiles, and what method could be best employed to teach boys and girls to spin.

The following year a law was introduced to encourage experiments with hemp since the wool and flax production was low and the Indians were known to successfully utilize hemp. In 1642 Massachusetts made an attempt to compel spinning and weaving and appointed overseers to direct the work. Fourteen years later we find the Massachusetts Bay Colony still struggling with the problem of textile production and in a new law passed in 1656, she assessed the householders for a definite production of yarn. One spinner's product was the usual assess-

ment although less was required if the family were engaged in some other useful occupation, or more if a household furnished several spinners. Every household must spin a fixed amount of yarn during the year. The courts were free to compel them to do so, and to clear the commons for sheep raising. The stint for the households taxed for one spinner was three pounds of linen, cotton or wool a week for thirty weeks. Countless similar laws for the encouragement of spinning in the colonies came down to the time of the Revolution.

A somewhat different and vastly advanced notion was the dawn of the early industrial schools. In 1718 some Irish spinners emigrated to Manchester, New Hampshire, encouraged by bounties offered in English papers. For some reason, Manchester proved distasteful to them and they turned back to their landing place, Boston. It was through their skill and interest the famous Boston Spinning Craze was inaugurated. Boston Common was the stage for spinning parties, and the fairest aristocrats of proud Beacon Hill took out their spinning wheels to the Common and spun for the encouragement of the industrious. From the Boston Common spinning parties developed the spinning schools for individual instruction two years later. Skilled spinners were appointed by the state with a grant of money to build and house spinning wheels and teach pupils free. Appropriations for these schools extend through fifty years of colonial history. These groups of spinners realized most keenly the opposition to textile development offered by English legislation, and in consequence took an active part in encouraging the American Revolution.

When Benjamin Franklin just prior to the Revolution, was in England attempting to gain some help for the young colonies he was asked what would be the result if duties were laid on the necessities of life. He answered, "I do not know a single article imported to the northern colonies but what they can either do without or make themselves. The people will spin and work for themselves, in their own houses."

After the Revolution, the necessity for greater and quicker production increased still more, owing to the curtailment of production by the war and the English attempt to induce the Americans to import English machine-made goods to compete with domestic goods. The new states offered bounties to skilled immigrants and to mechanics who could copy the new English machines.

Meanwhile the early colonial housewife must prepare her spun yarn for the loom. The tediousness of home manufacturing never slackened throughout the process, which became even more complicated when the loom was threatened for fancy weaving. The yarn must be in skeins of a definite fixed size for weaving. Weaving is the interlacing of two sets of strands or yarns at right angles to each other. The foundation threads are of equal lengths and are called the warp. The interlacing threads are called the filling or weft. In order to measure the yarn into skeins, the home weaver wound the yarn from the bobbins of the spinning wheel onto bobbins used in the loom. The process seems long to us today. It was as follows:

web or cloth beam. The yarn was stretched between the beams and held taut by means of weights attached to the beams. The principal motions in weaving are shedding, or raising the warp threads to allow the passage of the interlacing shuttle; picking, or throwing the shuttle through the warp; and battening, or forcing the filling into a compact mass.

The shedding in the colonial plain loom was accomplished by an appliance called a harness. The harness was made of two sticks the width of the loom and cut in alternate grooves and eyes. These sticks were called heddles or healds and the warp



In Days Gone By—The Old-Fashioned Loom and Spinning Wheel
(Courtesy of Draper Company)

First the yarn was wound onto a clock reel that ticked when it was set for a definite length of skein. The skein was then stretched on a swift, and the yarn wound once more onto bobbins for the loom. As the weaver filled her bobbins she placed them in a bobbin frame called a creel, and stood the frame in front of the warping bars ready to wind them off in lengths for the loom.

The colonial loom was horizontal and sometimes called the Zuni type. The frame held two beams at opposite ends of the loom. On one, called the warp beam, the warp threads were wound. The other held the finished fabric and was called the

thread was passed across them in threading the loom. A treadle was attached to the heddles, and worked by foot power underneath the loom. This left the hands free, and the foot depressed the alternate warp threads widening the sheds or openings for the track of the shuttle. When the filling threads had been forced through the warp, they were battened up compactly by means of a stick called the reed.

The first process in threading the hand loom after the skeins have been wound is called warping. This is laying parallel the requisite number of threads for the width of the fabric and the length of the finished cloth. It is a complicated method of wind-

ing the threads from the creel either onto warping bars or drums from which they are transferred to the warping beams. people are required to thread the loom and careful watch must be kept that the threads are neither broken nor so weak that they will break easily in the strain of stretching them. Today the large factories thread their looms by machines but the appliance is so expensive that even now in the smaller mills hand threaders are employed. When our forefathers had provided themselves with the necessary equipment for comfort and con-sequently had more time and inclination to experiment with fancy weaves, they increased the numbers of pairs of healds and also the corresponding treadles. By tying different healds to the treadles a variety of weaves was obtained, but the threading was not only still more tedious but extremely complicated.

Probably the immigration of skilled weavers and the desire to make cloth as beautiful as that which was smuggled in from England furnished the incentive to this more elaborate weaving. Something of the ruggedness of the Atlantic shore with its opposition to the wearing down process of the driving ocean must have entered into the souls of the early settlers. They were not at all derelicts from the Old World, but men and women of the middle class who desired the refinements of their time. Surely the old lustre ware and household furnishings that have come down to us testify to this, Above all they held fast to their vision of freedom, and it was this vision and a pride in competing equally with England that buoyed them up in their textile struggles when importation of goods even from one colony to another was denied them by the home government. It is this will to succeed against any opposing force that after its terrible devastation built up the South at the close of the Civil War, and that sent our men cheerfully into the World War. It is the will to succeed that we teach first to the newcomer on our shores. Since the World War some of our statesmen have talked about Americanizing the immigrant. The immigrant, however, breathes in with the air off Ellis Island the first principle of American independence, that there are no obstacles to an American's success. America's textile history is one long exposition of this motto.

The laws to advance and encourage textile production previous to the Revolution referred to in the foregoing pages, were the laws of the Massachusetts Bay Colony. The textile industry centered about this colony and continued to do so in later history. The

colonies north of Maryland passed similar laws and coped with the same general condition. New York or New Amsterdam when under Dutch rule, was restricted even from the home use of spinning wheels. The colonists disregarded the restrictions, and turned with grit and determination to supply their needs skilfully with inadequate supplies.

The colonial cities of New York and Philadelphia coveted beautiful fabrics for their ladies and dandies, so they kept a watchful eye ever ready to facilitate production and aggrandizement of textiles. The sea port towns of Salem, Boston and Marblehead vied with the fashion centres in craving and procuring fabrics even as the small town today emulates the large city.

New Jersey, Delaware, and Pennsylvania, very early in their history, were settled by the thrifty Swedes, Germans, and Friends, all of whom accepted the necessity of household production at first. Towards the close of the seventeenth century, all the northern colonies realized the advantage of attracting weavers to their shores and inaugurated a policy of bounties for the skilled textile workers. South of Maryland, and including it, the colonies had a much easier life. England desired the tobacco, rice and indigo from these southern colonies and in return sent them the bulk of her favor and trade. When the South received not only necessities, but luxuries from the mother country. the northern colonies were dependent on their family production. Early in the colonial history, England protected the importation of tobacco from the southern colonies by forbidding the tobacco trade with Spain. It was the textile industries that England strove to protect in those days and even carried protection so far as to forbid the colonies from loading ships with yarn or fabrics or even transporting them by horse or any other means between the colonies. Smuggling was perforce encouraged since the northern colonies were discriminated against while the South enjoyed luxuries all had shared in the home country.

More important to America's development, however, was the discontent and irritation bred in the North that a century later fermented in the American Revolution. So well had England unwittingly schooled her northern colonies in home production that they passed through the seven years of the war without extreme hardship. It was the women by their faith in their men and their industry and economy who made the American Revolution not only possible to contemplate, but a success in accomplishment.

Historians overlook the deep loyalty to the cause of independence that the South exhibited. The balance of trade in the early colonies hung in favor of the South. The South, consequently, had made no effort to produce home textiles. The Revolution came. The English commerce on which the South depended was interrupted, but that section remained loyal to the colonial cause and produced home manufactured clothing that Jefferson referred to as, in many instances, "coarse, unsightly and unpleasant".

Our colonial ancestors had not finished their work when they took the fabric from The processes of shrinking, dyeing and pressing were still to be performed. The earliest colonial kitchens were the living rooms of the settlers, because the big ovens must be heated and too abundant logging of fuel took time from other necessary pursuits. The early kitchen could not have existed as a family center without the mother's spinning wheel and dye pit. They were as essential to the economic life of the family as the bake oven. The processes of shrinking the woven fabric, called fulling, and also the carding of yarn were soon taken out of the home. Fulling was the first of the operations to be handed over to workers outside the home in the development of the textile

In 1643, one year after he had joined the Rowley colony, John Pearson erected the first mill in the country. It was a fulling mill, established on the Mill River near the Boston and Newburyport turnpike and also near the grist mill. The settlement at Rowley had been founded five years earlier in 1638, by a company of religious exiles from England. In England they had been expert weavers and immediately established themselves in their trade on coming to this country. They formed, perhaps, the first trade settlement in the country. They planned their town and established it while they worked. They owned no land individually until the town was laid out, five years after their arrival.

With the exception of a few fulling mills, of which the one at Rowley was the most famous, and perhaps a few carding mills established in the lofts of the grist mills, practically all the textiles used north of Maryland prior to the Revolution were home productions. Any family, the output of whose industry outstripped its necessity, bartered its fabric and yarn for groceries, and the grocer, no doubt, had ready sale to the less industrious.

These conditions were not sought by the settlers. They were neither eccentric nor

poor and were only too eager to supply their needs from the English market. England was developing a textile industry outside the homes and the weavers who plied it agitated their production with the idea of restricting the colonial production. The series of restriction and taxation in the colonies developed the ingenuity and skill of the settlers until ten years prior to the Revolution, they finally realized their economic independence. The result was a constant colonial agitation for boycotting all English imports. So skilfully and successfully was this agitation for non-importation carried out, that even the southern colonies subscribed to it.

During the Revolution, home manufactured uniforms, shoes and blankets clothed and shod the rebel army. Each state was required at first to outfit its own men; each town usually supplied its men. Later when the southern output proved inadequate, the states north of Maryland were urged to

greater production.

At the close of the Revolution, the usual post-war restlessness overtook the country. Production slackened in the homes and a craze for English importations developed that well nigh wrecked the economic independence for which the states had fought. The foresight and agitation of Washington, Jefferson, Franklin, and Coxe finally turned the tide of pepular feeling in favor of home production, and the factory system gained its first impetus about 1790. This early factory system was in no way comparable with our present factory system. It was an outgrowth of the home production, and in short, a banding together of neighbors and friends with common capital to labor for the advancement of the American textile industry. The foreign markets were now open to the young country, so necessity was no longer the task-mistress. The impetus was the more ideal vision of patriotism and American trade supremacy.

In 1810 manufacturing was considered so important in the developing states that Congress demanded a canvass of the country to take a census on manufacturing establishments and manufactures including household production. Tench Coxe was one of the foremost tireless agitators for native production of textiles and it was he who compiled the final report. The movement was not accepted graciously by the people because they suspected the possibility of taxation on the value of their manufactures.

In England, long previous, the English system of apprenticeship had firmly entrenched itself in the manufacturing of textiles. In the growing states, early hardship and necessity had so grounded the women in the value of their spinning wheels and looms that they handed down their determination with their home-made machines. In consequence, the professional weaver found it not only hard to overcome their tenacity of purpose, but even in early days to make a living. The era of the industrial revolution in America was far different from that in England. The professional textile workers in England who feared being thrown out of their jobs by the introduction of heavy machinery, attacked the inventor and destroyed his machinery.

In America, the influential men used every possible means to encourage professional production. They influenced Congress to pass tariff laws and offer government bounties for skilled weavers and mechanics, besides digging into their own pockets for capital to try out any and all feasible experiments. It was the women in a well-meaning though "fake" economy who held tenaciously to production within the home until regular organized manufactories proved that they could be depended upon. No doubt, the women who had the care of clothing the family were too near the uncertain economic conditions of the Revolution to trust experiments with the meagre supplies of raw material. When America's women finally accepted the manufacturing of textiles as a profession, they did so wholeheartedly, and it is their eagerness for new and better goods that furnishes the inspiration today for the mill owner.

The constantly changing, but ever present frontier wilderness proved a second factor in retarding the transfer of the textile industry from the home to the factory system. In the older established countries of Europe, the transition might be called definite and immediate in comparison with the change in America. The family in any frontier settlement is of necessity the economic unit.

Transportation facilities are inadequate and the pioneer is completely absorbed in a hand-to-mouth existence while he attempts to realize the dream that called him to the wilderness. The second stage of production in this country duplicated itself from the Atlantic coast to the ever receding frontier. The needs of the pioneer can well be summed up in the S.O.S. call that appeared on the first colonial seals, "Come over and help us", (used from 1629 to 1686). Venturesome spirits always responded to the cry and to the glowing inducements offered to the itinerate textile weaver, or tailor, or shoemaker. These wandering craftsmen entered the pioneer homes and assisted in making up the raw materials on the home-made machines. They lived as honored guests and departed with fat purses and the blessings of the household.

When the pilgrim, either on the Atlantic shore or on the western frontier established his first fulling mill, he took the initial step in making his settlement permanent. In quick succession, the carding mill and a dyeing and bleaching establishment followed, and all unwittingly the second step in the development of the textile industry under factory management had been taken.

When the settlement became permanent. the itinerate textile assistant was induced to set up a friendly little shop where he plied his trade and gossiped with his customers. These little shops bartered their work for the raw materials and the farm produce of the pioneer. It was a friendly, neighborly arrangement, and when work became pressing some of the more skilful families took part of it home. When a weaver was well liked and ambitious, he furnished his little shop with several spinning wheels and looms, and his neighbors spun and wove with him on a profit sharing basis. There was no question of social classes in these early establishments.

The last stage in the transition to the factory system in America was the importation and erection of power machines. required capital to erect and a waterway to run. A few of the small shops developed into the small factories but the majority of the factories were first established in the lofts of the grist mills, as previously men-The influential men in the town, sometimes assisted by the small shopkeeper, if he were venturesome enough to risk his little capital, united in importing the English machines and men to set them up. America should be as proud of these early pioneers in the peaceful pursuits as she is of the more spectacular war heroes. Not one of these public-spirited men who induced textile workers and mechanics to "come over and help us" quibbled over the price. always showed the spirit of fair play to the newcomer. The universal reiteration of fair and generous treatment in this early history of textile encouragement here, rang back to the shores of England and Europe and brought a constantly increasing throng of immigrants westward. In these early days, England forbade textile workers to leave her shores under severe penalties. She also prohibited the exportation of textile ma-America offered attractive inducements so it may be justly said that the early textile worker's brain and skill

received equal share of profit as well as risk with the capitalist. The machines The bulk of the workers were set up. at first consisted of neighbors with a smattering of the town's poor who needed employment and help. It was a co-operative system though it is doubtful if the workers so labelled it. It seem the natural outgrowth of the home production, and the experiment proved more successful than the rosiest dreams of the founders. America had always craved more luxury than she acquired and when the means to manufacture her own beautiful fabrics presented itself, her people received the new era with warm hearts and open arms. Production became more and more intense. England furnished the first powerful machines but America adapted them to faster and faster production. More and more labor was required to run them until the early neighborly intercourse between the workers disappeared and in its place, we have the keenly differentiated departments of the textile industry, each segregated, but frequently combined under one great plant or system.

With the dawn of the factory system came of course an overstock beyond what the local shops and sales-rooms in the factory could dispense. The manufacturer added to his anxiety of production the responsibility of acquiring a market. Two sources were open to him and with pioneer shrewdness, he availed himself of both. First, he established intercourse with distant consumers through agencies later known as the commission houses of Salem, Boston, New York,

Philadelphia, and Baltimore.

Samuel Slater, the father of the American cotton industry, was probably the first in this country to grasp the value of the commission house. He sent the products of his mills to Salem, Hartford and Philadelphia when he discovered the shelves of the local stores of Providence were overcrowded. The first commission yarn merchant was Elijah. Waring of Philadelphia. Boston and New York were somewhat late in establishing commission houses. Philadelphia, as the fashion center and capital of the new nation, must have proved a ready market for all yarns and fabrics. Salem was an important clearing port, and her colony of wealthy ship merchants, always ready to spend, and always desirous of showing off their cosmopolitan outlook, must have competed closely with Philadelphia as a fashion center.

The second market, and quite as important contemporaneously, was that of the frontier. Before the Revolution, young men in search of adventure and a living, loaded wagons with tin-ware at the import points on the coast and travelled with them into the interior. They peddled their tin-ware in a house-to-house canvass, exchanging it for farm and household articles.

The country expanded westward simultaneously with the extension of activities of the textile manufacturers. The market was on the western frontier if it could be reached, and the shrewd, farsighted mill men reached it by using the peddlers' routes and methods already established. Incidentally this colonial response to necessity was the foundation of the huckster trade so well established a generation ago and only uprooted because of the easy access of the comparatively recent automobile to trade centers.

The pioneer throughout the settlement of America, whether on the Atlantic coast or on the constantly shifting western frontier, always desired time to experiment with his methods of developing the wilderness. He never willingly concerned himself with household production of textiles if outside goods could be brought to him at fair prices. This willingness of the frontiersman to accept what the older settlements could provide constituted one of the chief incentives to production. Another incentive was the constantly inceasing prosperity of the country coupled with the protective tariffs that were inaugurated to shield the infant indus-The manufacturer readily adapted himself to a system of barter on the frontier where money was scarce. He accepted the raw materials in exchange for the finished product. The East with its older civilization and ever increasing prosperity gradually abandoned the agricultural pursuits to a very great extent. Here manufacturing was adopted as a profession with a fixed salary or as a safe investment for money already amassed in the fishing and shipping industries. Gradually the eastern farm disappeared or was forsaken for the gayer and more entertaining towns and cities that still supply much of the textiles for the entire country.

The introduction of steam as a motive force not only increased the area of the manufacturing centers but also furnished facilities for easier transportation both by inland river boats and by train. Gradually, this also increased the factory towns in the South and West, although a sentimental allegiance to the old established plants coupled with the ready access of the Atlantic coast to foreign trade and foreign labor has somewhat retarded the quick expanse of

textile manufacturing.

CHAPTER THREE

ORIGINAL AMERICAN MILLS AND THEIR FOUNDERS

The earliest American mills were auxiliaries of the home industry, frequently located in the town grist mill. Skilled textile workers with an ability to card more quickly than their neighbors undertook the work and the householder brought wool to the mill with his grain. In both instances he paid a percentage of his product for the rapidity of its transformation into thread or meal. The shrinking and pressing processes after the cloth had been woven were poorly done at home. This gave rise to the fulling mills. Garment production and household linen, however, were practically completed within the home. The eventual divergence of a mill system that took all processes from the housewife had a hard struggle for existence and finally won only because of proven economic advantage to each individual wife and

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The first of the early mills was founded at Rowley, Mass., in 1638. The owners were the followers of Rev. Ezekiel Rogers, a nonconformist who had migrated from England. They were weavers by trade and communists in their social organization. Records say that there were about sixty industrious families who plied their trade at the same time they built their town. There was no division of property for five years, or until after the central town was established. The children were encouraged to spin and the elders operated a fulling mill erected by John Pearson, a resident of Lynn who migrated to Rowley and united with them in 1643. The mill was built near the grist mill and close to the Boston and Newburyport Turnpike. records speak frequently of this mill community in cordial terms as a peaceful industrious center. Since no earlier textile business can be traced, it is probably the first fulling mill in the United States. From this date until the rapidly growing industry outstripped the dreams of its sponsors the various town and provincial assemblies urged consideration of textile production as a patriotic and economic improvement.

The Assemblies in all the northern colonies, as well as Maryland, occasionally took a census of textile manufacture, both in the individual homes and in the few trade centers or mills that existed prior to the Revolu-

tion. They offered bounties for production and an occasional skilful weaver applied for help from the Provincial Assembly. The protection was sometimes granted if the petitioner made reasonable demands. At other times the Assembly considered that his interests might conflict with the zeal of other weavers and thus become detrimental to the province, so the petition was denied or only partially granted. Such a plea was offered by Samuel Judson of Connecticut in May, 1741. He desired a loan of 250 pounds to manufacture duck and canvas. He offered testimony that the canvas was well liked by buyers when he had made it some three years earlier but that he had abandoned the trade because of losses in selling, outside of the colony. He was unwilling to mortgage his land to raise the money for re-establishment. His petition was denied and a late commentator believed that the Assembly was unwilling to burden the treasury when according to his own testimony Mr. Judson could himself raise the necessary capital.

During the Revolution, home production was hard pushed to supply the needs of the army, the members of which of course could no longer produce. Its close saw a distressed little nation whose markets were so deluged with English goods that she dared not gain a respite of even a few months lest she lose the economic advantage the war had brought her. If all the inhabitants of the new United States had been of the same mind, conditions would have been simplified. Interests and divergent outlooks divided the solid little nation into parties. Some sacrificed their time and their money to industrial agitation. Others believed that a wealthier nation could be built if we depended entirely on import trade for our textiles and expanded all our efforts to raise food stuffs for an exchange market.

Tench Coxe, Samuel Wetherill, Jr., Alexander Hamilton, George Cabot, Moses Brown, Benjamin Franklin, and other earnest men with a wide vision succeeded in wielding public opinion and so interesting the federal and state authorities that mills equipped with the new English power machines were installed in several localities.

Among the largest were the Beverly Cotton Factory, the Hartford Woolen Mill, the New York Manufacturing Company and the Alexander Hamilton Mills, the last mentioned in Paterson, N. J. All of these first mills failed because they depended on national pride to keep them alive and only secondarily considered thrifty management. Their value lay largely in arousing interest in manufacturing rather than actual accomplishment. The history of their rise and fall is similar in them all.

The Hartford Woolen Manufactory was one of these early factory systems. It was the first large American woolen mill run by water power in all departments. Among its famous stockholders were Oliver Wolcott, one of the signers of the Declaration of Independence. Peter Colt. whose nephew was

Machinery was expensive and trade reticent about supporting the new factory, so that only one dividend was declared, fifty per cent, five years after its founding and only a year before the buildings and machinery were sold at auction. During its short life continuous appeals for favor were made which were granted by the State Assembly.

The year 1788 marks the establishment of the first cotton mill in the United States, at Beverly, Mass. George Cabot and others, of Beverly, furnished funds of which a man mamed Leonard and a partner, Thomas Somers, set up a complete set of machines for carding, spinning and weaving cotton and wool partly by water power. The organization was called the Beverly Cotton Manufactory. This association competes with one in Philadelphia for the honor of being the



View of Early Lowell Mills

the inventor of the Colt revolver, and Jeremiah Wadsworth, the largest stockholder. The society was organized in 1788. The Connecticut Assembly exempted the enterprise from taxation and offered a bounty of one cent per pound on all cloths woven before a fixed date. The second year of its infancy found it successfully running and advertising in much the same way that a modern enterprise advertises in its initial undertaking-first, by legitimate, paid, newspaper advertisements and second, by news items to arouse public interest. Washington on his second inauguration April 3, 1789, his Vice-President, and all the Connecticut senators dressed in cloth woven at this mill. Though the papers commented favorably, Washington must have felt deeply the exigency of the times in American textile production to lend himself to a semi-advertising scheme at his inauguration.

first to be established in the United States. lt was really a question only of days between the Beverly Cotton Manufactory and a factory established by the Pennsylvania Society for the Encouragement of Manufactures and the Useful Arts. Tench Coxe and Samuel Wetherill, Jr., established this society as an outgrowth of an older colonial society. Each member was taxed ten shillings annually and this was called the manufacturing fund for the purpose of establishing factories. One of the objects of the society was to employ the needy, and immediately upon organization, over 200 women were engaged in spinning linen yarn from flax bought by the company. A house was purchased and furnished with a carding machine, four jennies and a loom, and opened for work April 12, 1788. Neither this nor the Beverly Mill was successful, however, owing to the competition in trade offered

by England which produced better goods and undersold the United States product. The interstate duties on textiles and financial depression in the United States between 1782 and 1789 hampered them also.

Perhaps we were too near the Revolution and our citizens were too weary of novelties to chance a new enterprise, or perhaps the post-war extravagance with its accompanying 'laissez faire,' defeated these early factory attempts quite as much as mismanagement. At all events, it remained for Samuel Slater and Moses Brown in 1790 to establish the first successful American textile mill.

This was the beginning of paying textile production and inaugurated the second era of American machine-made cloth industry that gave rise to Lowell, Lawrence and Fall River, the largest mill centers in old New England. Many public spirited men, including Moses Brown, had spent much money both from their private coffers and the state treasury to advance the American textile industry when Samuel Slater, an English weaver, migrated to New York in 1789. No one had succeeded in establishing the English textile machines satisfactorily in the United States. The job was well nigh discouraging but the colonists refused to give it up.

An English paper reported the new country's efforts to gain any knowledge of the marvelous new English machinery. Young Slater saw the article which fired his imagination to sail to this new country toward which his sympathies already leaned. His departure was as dramatic as that of any hero in a novel of adventure setting forth to seek his fortune. As a boy he was apprenticed to Jedediah Strutt in his cotton mills at Milford. Very early, he showed signs of being a mechanical genius, and at the time of his emigration to the United States had memorized the parts of the different textile machines of the Arkwright system. England had passed laws to prevent the weavers and models of her machines from leaving her shores. Slater knew this and so disguised himself as a farmer and left his home secretly for London, whence he expected to embark for America, the land of glowing fortunes. No ship was ready to sail and so he wrote home of his whereabouts in case his unexpected departure had caused any uneasiness. A ship finally cleared port, on September first, 1789, and he landed safely in New York sixty-six days later. With ambition urging him forward, he gained work within a week in the cotton factory of the New York Manufacturing Society on Vesey street. In less than a month, the alert young mechanic felt discontented in his new job and sought information of other openings, by mingling with the sailors along the water front. The captain of a coast-wise sloop acquainted him with a cotton firm in Pawtucket whose owner, Moses Brown, spared no expense in experimental machinery. At once young Slater wrote him, offering his services as manager of his mill and stating his credentials as a spinner.

In reply, Moses Brown of the firm of Almy and Brown, wrote frankly of an unsuccessful attempt to install water spinning frames in his factory. These were probably the first in America and failed because they were clumsy and imperfect and no native mechanic could adjust them. In conclusion, Moses Brown expressed a desire that Mr. Slater visit his mills if his employment displeased him, and added quaintly, though with no lack of business acumen, "We hardly know what to say to thee; but if thou couldst perfect and conduct them (the frames) to a profit, if thou wilt come and do it, thou shalt have all the profits made of them over and above the interest of the money they cost and the wear and tear of them. We will find stock and be repaid in yarn as we may agree for six months and this we do for the information thou canst give if fully acquainted with the business."

The firm, far advanced for its day, was desperately in need of mechanical ingenuity. Young Slater supplied it miraculously for he had only his own memory and skill to rely upon while constructing the new complicated machines. The carding machines caused him endless worry, and constant discouraging delays dogged his path. The firm supported him so staunchly that they admitted him to partnership only three months after his initiation, and many months before the factory was running. The plan on which the mill*

Resolved: That the movement to acquire and preserve as a museum the old Slater Mill at Pawtucket, home and birthplace of the first successful and complete cotton spinning mill in America, has the hearty and sympathetic endorsement of the National Association of Cotton Manufacturers and that its members are earnestly urged to contribute in all practicable ways to the success of this worthy undertaking.

^{*}The Old Slater Mill Association, of which Henry C. Dexter is president, has been incorporated in Rhode Island to raise funds and provide for converting the building into a textile museum. This Association met March 29, 1921, for the adoption of by-laws and the election of officers. The proposition was agitated some time before the actual incorporation of the Association and at a convention of the National Association of Cotton Manufacturers held at Maplewood, N. H., in September, 1920, the following resolution was adopted:

was founded seems a curious cross between English factory methods and Yankee freedom and generosity. It was the American response to success that won young Slater his partnership, and no less was it a modified English apprenticeship system that formed

the nucleus of the employees.

In December, 1790, the first record is made of working the mill though it had been running nearly two months. It was set up in a clothier's shop in Pawtucket and consisted of three cards, a drawing and roving machine and seventy-two spindles of the Arkwright type, driven by water power. The operatives were largely children from eight to fourteen years. Samuel Slater realized the advantage of a common school education in his own life so he soon established a Sunday School. For a time, he taught the ization, for that was soon to be accomplished far better by Francis C. Lowell, but in fitting into the life about him where some might have antagonized the housewives. Slater was not a weaver but a spinner, a proud spinner too. Year after year, he opposed adding weaving to his factory pursuits. He sold his yarn to the neighboring housewife and saw to it that it was better cheaper yarn than she could produce. The housewife wove it until long after powerweaving was introduced and demand forced Slater to weave by machinery.

When he became overstocked with yarn, in the early days of the experiment, Moses Brown was much alarmed and insisted on a shut-down. The resourceful Mr. Slater pooh poohed his partners' fears and enlarged his market to include Salem, Hart-



The Hip Roof Structure in the Foreground Plant of Boston Manufacturing Company About 40 Years ago. is the Original Building Erected in 1813. It is now Mill No. 1

children and later engaged students from Rhode Island College (now Brown University) to instruct them. This was the first Sunday school in the United States, though it was not conducted entirely on religious Wages were paid in factory store produce instead of in coin. The whole system seems to have been somewhat paternal, an adaptation from the English apprenticeship system. In fact, Mr. Slater at first attempted to establish a system analogous with the English but was so unsuccessful that he early modified it to fit American standards.

After these first mills were established, Slater and others associated with him branched out into neighboring towns and established secondary mills. His men sometimes set up mills too, always of the same type. His talent lay not so much in organ-

Philadelphia, and eventually New ford, York, Boston and Baltimore. Thus rose the commission house in America. The first agent was Elijah Waring of Philadelphia and the second, Jeremiah Brown, a brother of Moses.

During the first years of yarn production, Mrs. Slater (Hannah Wilkinson) experimented in twisting some exceptionally even cotton threads to substitute for linen sewing thread. Her playful attempt to show her husband a competitive talent resulted in the first cotton thread mill in America, founded by the Wilkinson Brothers in 1793.

Samuel Slater is called the father of American cotton manufacturing. His ability lay largely in mechanical genius and his training in England under Strutt gave him the advantage of managing a large organization and reaching out to a market. His business astuteness held him in the path he thoroughly knew until his love of machinery could blaze a successful path into textile weaving.

Somewhat at variance with his methods were those of Francis Cabot Lowell, the founder of the Waltham Mills. Mr. Lowell, a young Harvard graduate, became interested in cotton manufacturing while visiting England with his wife in 1811. He knew the difficulties attending any adequate production of cotton textiles in America and that machinery was slowly usurping the place of the fireside industry. For two years, he studied the English system of production in the hopes of establishing a successful factory on this side of the Atlantic. Finally, he returned home with no knowledge of the power loom beyond hearsay, but well informed with regard to the ordinary Ark-

wright machines. With the steady enthusiasm of several years' study and contemplation, Lowell aroused his brother-in-law, Patrick Jackson, to an equal interest and faith in the venture of establishing a power mill. They banked their hopes on New England's water supply, for power, and on her moral, well-educated citizens for craftsmen. In 1813, the year of his homecoming, they purchased the water power rights of a paper mill in Waltham. This Lowell incorporated under the name of the Boston Manufacturing Company, shortly changing to the Waltham Company. The stock holders were the friends of Mr. Lowell and his brother-in-law and the company was capitalized for \$400,000, only \$100,000 of which was to be raised until success was as-

With his knowledge of English textile machines to aid him, Mr. Lowell and an assistant, Paul Moody, experimented in making a power loom. While the factory was under construction, they worked in a down town store on Broad Street, Boston. In 1814, the new factory stood ninety feet long, forty-five feet wide, five stories high, with a double pitched roof, heavily braced, and running 3,000 spindles, and the new power loom was sufficiently successful to warrant erecting one in the Waltham Mill.

sured.

Mr. Moody was an expert mechanic and invented a warper to wind the threads in the beam of the loom from the bobbins and also a filling throstle and a double speeder over which a patent litigation arose. loom was unlike the English loom in that a revolving cone was the principle of motion instead of the crank later introduced into the competitive Slater mills. With Mr. Lowell's alert understanding of what was needed to eliminate waste and time in machine work and Mr. Moody's mechanical skill to perfect the ideas advanced, the Waltham Mills equalled if not surpassed the earlier Rhode Island mills.

The organization was also considerably different from the Slater organization. Here the employees were largely young women rather than children or whole families. The girls lived in factory built boarding houses that took only operatives for patrons and were chaperoned by matrons of good moral character. Wages were paid in coin as often

as every two weeks.

The foundations of the American mill system were laid in the Waltham Mills. Mr. Lowell was keenly alert to eliminate all waste in time and labor and to this end he organized both the actual processes of manufacturing and the administrative department. They later included a board of directors, chairman, and treasurer, who was responsible for buying the raw product and selling the finished textile. There was also an agent, who reported to the board of directors and supervised the actual work in the mills through the superintendent, and the master mechanic. The master mechanic had charge of the buildings and machinery. The superintendent received the complaints and reports of the overseers in each department, who in turn supervised the operatives.

The Waltham factory was so great a success that the capital was increased from \$400,000 to \$600,000 to enable the company to buy another site near Watertown. Francis Cabot Lowell acquired a large capital as a young man by engaging in foreign commerce. With this and the backing of several Boston capitalists, he was able to branch out into new fields. Whatever advantage he lost by his lack of familiarity with mill methods either in England or Rhode Island, his knowledge of business organization offset. When the Waltham Mills were an established industry, Lowell and his advisors, Jackson and Appleton, desired to expand and sought a new territory with a water way that could be developed. In a casual visit, Moody, the assistant mechanician hit upon the Pawtucket Falls at Chelmsford. The desired land about four square miles in area, was owned by farmers. Kirk Boott, an Englishman, and Thomas M. Clark, interested in canal possibilities, were sent to buy the required tract. They purchased 400 acres for \$110 an acre and incorporated a new company under the name of Merrimac Manufacturing Company on Feb. 5, 1822.

While these negotiations were being completed, Mr. Boott also gained control of the canal company, known as the Proprietors of the Locks and Canals of the Merrimac River. Immediate construction of an enlarged canal with branches was undertaken at a cost of \$120,000. The next summer the Waltham Company sold their patterns and patent lights to the younger Merrimac Company for \$75,000, and also released Paul Moody who was under contract. The new mill, erected in a point advantageous for the use of the Falls, was started in the early autumn of the same year. The first cloth was rather

of \$100 was declared one year after the manufacturing center had been incorporated as a separate town from Chelmsford under the name of Lowell in honor of its founder Francis Cabot Lowell.

The manufacturing companies that bought their canal and leased their water rights from the Merrimac Manufacturing Company were the Hamilton Manufacturing Company, 1825; the Appleton Company, 1828; the Lowell Company, 1828; the Suffolk, 1830; Tremont, 1830; Lawrence, 1830; the Boott Company, 1835, and the Massachusetts Company, 1839. Constant improvements



PATRICK TRACY JACKSON
One of the Founders of the Boston Manufacturing Company

unsatisfactory but the owners continued to enlarge their plant. First a brick machine shop was built where the mill machinery was fashioned. Unused land was sold to other mills, and also the privileges of water supply for which the Merrimac Company cut all necessary canals. Enormous profit accrued from the sale of these manufacturing sites and the old farmers who had sold land for \$40,000 that now brought at least a dollar a square foot vented their indignation in a topical song about Kirk Boott who had become agent for the new Merrimac Manufacturing Company. In 1825, the first dividend

of the canal system were made and the corporations leasing the water rights finally became part owners in the system which gave an additional boom to the town. It became a city in 1836. Dickens, whose American observations offended many on this side of the Atlantic, praised the working conditions as superior to England's and also the houses and daily happy life of the operatives.

Second in time to the Rhode Island mills, the Francis Lowell mills stood on an original basis, second to none. The elastic organization furthered both internal development

and territorial expansion. The boarding houses, sunny work rooms, community libraries, and entertainments were the nucleus of the modern factory system no less than the actual running of the factory and machines.

A comfortable environment tends to make a contented, more efficient workman. the case of the Francis C. Lowell enterprise, it aided vastly in weathering the depression after the war of 1812 when many smaller experiments failed. Manchester and Lawrence, among the large textile centers, were founded on the same underlying order as the Waltham and Lowell corporations. Fall River, Paterson and Philadelphia were slightly at variance. In general, it can be said that Massachusetts and Northern New England (New Hampshire and Maine), followed the plan of industrial incorporation while Rhode Island and the Central States were developed like the Slater Mills, by individual or joint ownership.

LAWRENCE

The city of Lawrence had a growth similar to that of Lowell, with Daniel Saunders of Andover as the founder. He was a wool dealer and thoroughly realized the need of water power in the mill business. Plans of the Merrimac Canal filled him with enthusiasm to attempt a similar project near Andover, and for ten years he gradually acguired land about the Peters Falls. When he controlled the Falls in 1843, he interviewed several prominent mill owners of Lowell with a view to forming a new manufacturing company. Many called the new project 'Saunders Folly,' but nevertheless a successful company was formed to improve the upper Merrimac under the name of the Merrimac Water Power Association and the town of Merrimac in Massachusetts was founded somewhat later. This took the name of Lawrence in honor of Abbott Lawrence, one of the original directors. In 1845, the Essex Company was incorporated and on the same day bought out all rights of the Merrimac Water Company as well as assuming all obligation. Most of the original subscribers were members of the new organization and Abbott Lawrence became its president. The town was laid out in 1845. The Washington Mills, later known as the Bay State Mills, were built the following year and in 1848 a great dam was thrown across the Merrimac with a chain of canals. The Atlantic Cotton Mills also opened in 1848 and the Pacific Mills in 1843. They both elected Abbott Lawrence as president. Many of the Lawrence mills are woolen manufactur-

The American Woolen Com ing plants. pany now controls several of these first mills, especially the Wood Worsted Mill, known as the largest worsted mill in the world.

MANCHESTER

Manchester, N. H. was founded September 3, 1751, under the name of Derryfield. The father of Captain John Stark of Revolutionary fame, was one of the original settlers. The attraction in pre-Revolutionary days was the salmon fishing on the Merrimac in the neighborhood of the Amoskeag Falls, The early settlers were staunch, sturdy Americans and when the news of the Battle of Lexington reached the little fishing town thirty-four of the thirty-six men united with the selectmen to enter the American army at once. These made up the famous company captained by John Stark. The Stark Mill, incorporated in 1836, was named for this family.

The next episode in the life of the little town was the arrival of Samuel Blodgett in 1793. He was a native of Woburn, Massachusetts, and at seventy, once more agitated a new project. His life had been so vicarious that he might justly have earned the title of Jack-of-all-trades. In the Revolution, he was a sutler, later a judge, and at the time when most men retire, he entered on a double project of transporting lumber down the Merrimac and building a mill town near the Amoskeag Falls that he prophesied would be the Manchester of America. His first object was to build a canal around the Amoskeag Falls. This he succeeded in doing by spending practically his entire fortune and all other money he could raise by lotteries authorized by the state. The canal made lumber transportation possible but vast sums were needed to build factories to complete his vision. These he was unable to raise and died four months after the completion of the canal in September, 1807. Three years after his death, Derryfield took the name of Manchester in honor of his memory and a town monument was erected bearing the inscription, "Judge Blodgett, the pioneer of internal improvements in New Hampshire.'

During the three years, Benjamin Pritchard of New Ipswich had emigrated to Bedford, two miles below Derryfield. The first factory was built by Benjamin Pritchard, Ephraim David, and Robert Stevens as joint owners under the name of Proprietors of the Amoskeag Cotton and Woolen Factory. The original mill was only two stories high and forty feet square. The cotton was

cleaned by the neighboring householders and the cloth woven in the neighborhood. The machinery was merely for spinning. In spite of its cheap equipment, the little firm was not financially able to swing the project and incorporated six months after founding in June, 1810, as the Amoskeag Cotton & Wool Manufactory. The new firm operated for six years and lay idle for six years more. Olney Robinson, another Massachusetts man. bought the plant and in turn sold it to Samuel Slater and Larned Pitcher In 1825 the new owners sold the controlling interest to

NEW BEDFORD

Shortly after these developments in Manchester, Thomas Bennett, of New Bedford, agitated a cotton manufacturing enterprise that resulted in the enormous manufacturing interests in that city. The original project was for New Bedford capital to start a mill in Georgia, but money was slow in coming for such a far off experiment. Joseph Grinnell agreed to assist if the mills were built in New Bedford and subscribed \$12,-100. The New Bedford whale industries



Old Bell Mill
One of the Early Mills Acquired by the Amoskeag Manufacturing Company

Willard Sayles and Lyman Tiffany who erected two new mills and introduced sheeting and ticking manufacturing for which the Amoskeag Manufacturing Company is still justly famous. A new company was incorporated in July, 1831, with a capital of a million dollars. This company bought all the water power of the Merrimac from Manchester to Concord, and laid out the town of Manchester in house lots and store sites, reserving a fixed area for living quarters for the mill employees. The canal and water rights were sold and leased exactly as in Lowell and Lawrence and the mill city of Manchester was inaugurated.

were antagonistic to this new enterprise so that only \$160,000 was raised. A charter was granted, however, in 1846 under the name of Wamsutta Mills. Construction on the mill, boarding houses and tenements began immediately and a tract of land suitable for water power and for a transport point was purchased during the summer. In 1849 the capital was increased and the following year the first dividend was declared. The mill weathered the Civil War successfully and Wamsutta shirtings became world famous. Dividends and new mills of the same company followed each other in quick succession. A new company, the Potomska Mill,

started twenty years later, followed in 1881 by the Acushnet and the New Bedford and City Manufacturers in 1882. Today New Bedford is one of the largest eastern mill centers, particularly for fine goods, with a climate admirably adapted to cotton manufacturing.

FALL RIVER

Fall River takes its origin from 1656 as an offshoot of the Plymouth Colony. Its history up to the Civil War is a series of strange vicissitudes varying from Indian uprisals to interstate disputes over its boundaries. Established on two different territorial grants, the expanding village formed itself in two states, Massachusetts and Rhode leland, with conflicting jurisdictions, until 1862 definitely settled the dispute and the so-called "Border City" came entirely under Massachusetts laws. The only relic of the early dispute is in the name of the "Border City Mill."

Had the little village been less advantagecusly situated, the boundary dispute would scarcely have waxed so hot, but Fall River commands what are regarded as the finest fresh water lakes of any city in the country, and also a vast water flow from these lakes to the bay, known as the Quequechan River. Added to this, Mount Hope Bay, Fall River's harbor, is deep enough to float any vessel and ranks the city as a possible entry port to the United States. Early settlers, however, learned to depend on New York and Boston for their commercial link with the outside world and developed the textile industry exclusively. New financiers follow in the footsteps of established business, especially when large sums are at stake and Fall River continues in its most satisfying path of large textile development.

The pioneers of the Fall River industry was unquestionably Colonel Joseph Durfee, hero of Tiverton Village. When he was sixty-one years old, he organized his fellow townsmen into a mill company. The original mill was one story high, and contained several spinning frames, cards, and about five hundred spindles run by water power from the Globe ford that was so uneven that it is said sometimes the machines fell apart.

The mill confined itself to spinning and sandwiched its work in between cotton ginning, performed in the homes of the neighboring housewives, and weaving, also accomplished by the outside workers. The final step in cloth manufacturing, pressing and finishing, was performed by the mills, which then sent the finished product to Fall River proper for sale and thence by coastwise ship to Providence. Col. Durfee gave

up the mill in 1829, discouraged at its lack of promise and soon it became the Tiverton Print Works. Year after year the old mill changed its policy and its owners until The Globe Yarn & Laurel Lake Mills Company purchased it because of the water power it commands.

Colonel Durfee's failure did not discourage prominent fellow townsmen from attempting to incorporate for the manufacture of cotton and woolen goods. Samuel Slater's success was town gossip on the village streets that fired men's ambition to do likewise with the falls and river power at their gates. The first successful venture was that of the Troy Manufacturing Company in 1813, later known as the Troy Cotton and Woolen Manufactory. Oliver Chace, of Swansea, Mass., a town four miles distant from Fall River, inaugurated this mill. Mr. Chace had had a little experience in cotton manufacturing at Swansea Factory. He was a young carpenter and in 1806 bought a one-fourth interest in "an acre of land, blacksmith's shop, corn mill, cotton factory, and two dams." He operated the cotton mill until 1813, when he removed to Fall River, at the suggestion of Nathan Wheeler.

Of the association formed to erect a mill, Mr. Chace was the only member who had any knowledge of spinning cotton yarn by water power. He accordingly took sole charge of the construction of the building and equipping it. He also subscribed for a tenth of the stock in the new company and became its agent. The stock holders, twenty seven in number, divided 100 shares and capitalized for \$50,000 to be raised by instalments. Amey Borden, a widow, was the sole woman subscriber, pressed in, no doubt through the ownership of six acres of land that controlled the water power known as the Upper Privilege on the Fall River stream. At the first meeting of the company, each stockholder, with the exception of Mrs. Borden, was assessed twenty dollars a share and before the fall of 1813, a stone mill was under construction on or near the site of an old saw mill on her land. The little mill, a giant industry in its day, was only 108 feet long, 37 feet wide, and four stories high with a low-pitch roof. It was built of stone from the adjacent fields. Originally two thousand spindles were run and, as in Colonel Durfee's enterprise, the cotton was both ginned and woven in the neighboring households. In 1821, the original mill was burned and the company established a few machines in a smaller building while they leased the Globe Mills and built a second stone mill on the original

site. The first large expansion came in 1843 at a cost of \$33,000 and this building became the nucleus of the modern Troy Cotton & Woolen Manufactory plant.

The second large manufacturing plant in point of time, and preceding the Troy Manufacturing Company in actual opening, was the Fall River Manufactory. David Anthony, experienced in the Slater Mills in Pawtucket, fathered this enterprise and interested Dexter Wheeler in it. Both young men had had experience in cotton spinning, Anthony in Pawtucket and Wheeler in Rehoboth, Mass. The new factory was erected at the head of the third fall from tide water, was sixty by forty feet, three stories high, and ran 1500 spindles. The lower story was of stone and the upper ones of wood. Much interest was created by the statement that there was not enough stone in the state of Rhode Island to build the three stories. Mr. Wheeler made most of the machinery and Mr. Anthony organized the community both for support and for employees. Spinning began in October, 1813, five months before the Troy Mills opened. This was the first cotton spinning mill in the actual village of Fall River. Four years later power weaving was introduced into the factory. Sarah Winters started the first loom, Mary Healy the second, and Hannah Borden the third. These looms were built by Dexter Wheeler and ran most unevenly. The early weavers were paid by the week at the rate of \$2.50 but when the looms were perfected and the weavers became experienced the system of yard payment was introduced. As the Fall River Manufactory Company precedes the Troy Manufacturing Company in actual spinning so it also antedates it by a year in installing power weaving machinery. In 1819, the Fall River Manufactory employed fifteen weavers, each running two looms, three dressers, ten spinners, and three carders, besides several overseers.

PHILADELPHIA

On the eve of war with England in 1775, prominent public spirited citizens of Philadelphia had the temerity to organize "The United Company of Philadelphia for Promoting American Manufactures." Christopher Marshall, chairman of the organization, was a descendant of one of William Penn's associates and himself a Quaker. At sixty-six years of age, he was retired from active business and devoted his time and money so vigorously to the patriots' cause that the Society of Friends excommunicated him as too warlike. Samuel Wetherill, Jr., a fellow charter member, was also a Quaker and

likewise excommunicated indirectly because of a gift of uniforms to Washington's Army at Valley Forge. So firm were these men in their patriotism that they banded together not only for textile production, a crying need of the colonists, but also for worship analogous with the faith of the Friends and called by their adherents Free Quakers, and popularly Fighting Quakers. The textile society drew its members from the ranks of the Free Quakers and successfully plied its trade until Philadelphia was occupied by the British.

The business was not resumed, but in



WILLIAM AMORY
President of the Amoskeag Manufacturing Company from 1837 to 1876

August, 1787, Tench Coxe organized a second society called the Pennsylvania Society for the Encouragement of the Useful Arts. Mr. Coxe was a prominent young merchant in Philadelphia. Business courtesy, he felt, forbade him entering actively into the Revolution, but his heart and soul went out to his fellow countrymen. At the close of the war, he eagerly served in the Federal Convention and as Assistant Secretary of the Treasury, continuing in active public service until 1812. Under his flattering tongue and pen, cotton became a desirable commercial product instead of a garden ornament, and cultivation was boomed in the Southern States. To prove his honeyed words of prosperity to cotton producers, Mr. Coxe emptied his own pockets to import English machines and laborers to run them. For thirty years he fought valiantly for the development of the textile industry, and assisted the Pennsylvania Society to equip a factory at the corner of Ninth and Market Streets. A carding machine, four spinning jennies and eventually twenty-six looms were operated. The work was satisfactory, but the eventual failure of the enterprise was largely due to lack of business acumen. The factory was destroyed by fire in March, 1790, and was never rebuilt.

PATERSON

Tench Coxe, a close triend of Alexander Hamilton, may have interested him in textile pursuits for the young nation. At all events in 1791, Mr. Hamilton, Secretary of the Treasury, organized a Society for the Establishment of Useful Manufactures. A suitable location in or near New York was advertised for a factory whose capital stock could be estimated at about \$200,000. The committee decided on the Great Falls of the Passaic in New Jersey, and the prospective town was named Paterson after the Governor of the State. A plant was charted with appropriations of \$20,000 for a canal, \$5,-000 for factory and \$12,000 and \$5,000 for the print and weave-shop respectively. While construction was under way a wooden mill was erected and the machinery run by oxen which gave rise to the name of the Bull Mill. For two years construction dragged on, funds were mismanaged, and finally stockholders refused to subscribe and the The original company, mill was closed. however, held the water rights that became a most valuable asset when Paterson at length came into its own as a great silk textile cen-

Today all of these enterprises seem like toy villages beside the large plants of the modern industries, but they were the embryo of all that the American textile industry stands for with its far reaching tentacles, and the modern mill man is justly proud of his heritage, crude though it seems at the present time. To overcome its crudeness was a Herculean task. First, reliable householders near the mill were sought to pick the cotton and weave it. Time was lost not only in finding suitable workers, but in transporting the goods several times in process of construction. All the Rhode Island and Fall River promoters were more or less

skilled in the mill processes but the more northern towns of Lowell, Lawrence and Manchester were founded by merchants with little or no mechanical skill.

All recognized the value of organization, however, and the necessity for a staple market for their goods. To this end each factory solved the problem as an individual. Slater sought his market in Philadelphia, Salem, Boston, New York and Baltimore. The Fall River Manufactory sold largely through much the same houses. The Troy Company found their staple markets in Massachusetts, Maine and New Hampshire and in 1819 established a store at Hallowell, Maine, with their personal agent, Harvey Chace as director. His salary was \$300 a year and board. In the fall of the same year, the Troy Company also sent an agent to Georgia with a shipment of goods to barter for raw cotton. The Waltham Company sold through a Cornhill shop in Boston and later through Ward & Co., importers of British goods. The experiment of selling through Ward & Co. was so successful immediately that the practice employed forms the basis of the modern selling methods today just as the Waltham organization is the foundation on which all recent textile mills rests.

Modern textile industrial development in this country has been two-fold. It has been first an internal development or assemblage of operators and machines so that no time shall be wasted. The new machinery is made with staple parts that can be readily replaced in case of a breakdown, and the operatives perform the most simplified movements thousands of times a day that labor and time may be conserved. The second development, no less important, has been the gradual shifting of textile centers since the Civil War. The Piedmont Section through the South is a fast expanding textile territory, and the problems faced by the northern factories again arise in this newer district. At first the South produced coarse textiles, beginning as the pioneer factories of long ago. Later, however, fine grades of textiles were attempted successfully just as in the earlier mills of the North.

The Middle West, too, has attempted textile production, though knit goods seem to be their chosen field. The expense of long hauls is a great draw-back for the western territory, and many financiers prefer to cling to agricultural pursuits with their well-known lucrative returns.

CHAPTER FOUR

INVENTORS, INVENTIONS AND IMPROVED PROCESSES. INTRODUCTION OF POWER AND AUXILIARIES EFFICIENCY

From 1500 to 1700 there was practically no change in the machinery for weaving or for spinning. A knitting machine, however, was invented in 1589 by William Lee of England, but was not used because of Government restrictions, and was not revived until 1816. There seems to have been a sentiment in the 15th century that a ruler should not allow the use of any invention for rapid production because the market would be over-stocked and the laborer lose, consequently, his means of making a living. Perhaps this caused some of the lethargy in invention during the 15th century, but the incentive seems to have been not so much for greater production as for more beautiful fabrics. When America was opened for colonization and a different social order was inaugurated, there came a real need for rapid production. The artisan still owned and frequently made his tools so that the more mechanically inclined spinners and weavers tried to increase their output by some improvement in their implements. Those less skilful in the mechanics of their trade banded together to destroy the inventor's machine for fear that his greater output would take away work from them and thus destroy their means of livelihood. This period might, however, be called the Period of Industrial Evolution, because from a hand, home industry, textile production evolved into a machine industry installed in its own buildings. In the factories of those days the inventor was one of the firm and the machinery was made by him with the help of trusted assistants in the basement of the mill in which it was to be operated.

The early Continental inventions were mechanical devices for passing the shuttle through the warp. They were De Gennes' loom in France (1650) and the Dutch or swivel loom in Central Europe (1724). These were introduced into England with little success. The first successful invention, strangely, was in weaving rather than in spinning. This was the fly shuttle invented by John Kay. It was a mechanical device for throwing the shuttle twice as quickly as by the hands. Kay placed under the warp a shuttle track with a box at each end to re-

ceive the shuttle. Each box had a spindle and picker. A cord passed from the picker to a lever and into the weaver's hand. When the weaver pulled the cord, the spindle was struck by the picker so that it travelled across the race at the same time that the weaver battened the filling with his left hand. The economic advantage was speed and the possibility of a wider loom. Kay's invention was met with scorn and angry demonstrations in what is known as the Industrial Revolution which marks the transition from hand productions to mechanical, rapid production. He was obliged to leave his home town. Eventually, driven by the demand of this rapid production, the weavers adopted the fly shuttle and organized a "Shuttle Club" for its use. Kay was unable to gain government protection and bankrupted himself in the courts though every suit was decided in his favor. He also installed various carding and dressing improvements and bettered the needs of his loom by using metal inserts. He died in poverty in France, however, though a modification of his invention is used today in weaving.

His son, Robert, in 1760, invented the drop-box, a device for weaving colored weft into textile without stopping the machinery to change the thread. At each end of the shuttle race, he placed several shuttle boxes, each containing a bobbin. A mechanical device dropped the boxes into position for throwing the shuttle as the color needed to be changed. In this manner figure weaving was introduced.

With the increased production in textiles came a demand for increased production in yarn to keep the looms busy. John Wyatt and Lewis Paul together originated the principle of spinning by rollers, but its use at the time when discovered, 1738, was unsuccessful

Lewis Paul in 1748 invented a carding machine which was a system of revolving cylinders covered with wires between which the fibre was drawn. It is the foundation of the modern carding machine.

James Hargreaves, sometimes called a carpenter because of his skill in mechanics, made the first successful improvement on the spinning wheel and called it after his wife, a spinning jenny. He was a poor weaver and had improved the carding methods in use when the idea came to him to attempt spinning several threads at one time instead of the singe thread. He worked on his model for three years finally patenting a machine employing eight spindles. The number was soon increased and finally reached one hundred and twenty. It was still a hand machine however, though the forerunner of the modern mule.

The story of the invention is as follows: James Hargreaves with the vision of a multiple thread spinning wheel always in mind, one day saw a spinning wheel overturned in his home or factory. He noticed that the large wheel when placed in an upright position again continued to revolve and turn the spindle. He conceived the idea of turning a number of spindles by means of the one wheel if they were placed side by side. He built a large oblong frame and placed the hand-moved wheel in the right front corner nearest the worker. This wheel he connected by a band with a cylinder under the frame; the cylinder was also connected with eight spindles set side by side in an upright position opposite the worker. The turning of the wheel, accomplished by a crank in the worker's right hand, set the spindles revolving. The spindles were fed by bobbins under the frame by means of a holder attached to a hand-drawn carriage which moved back and forth stretching the roving and twisting it by the revo-lution of the spindles. When one set of rovings in the holder had been twisted sufficiently, the wheel had to be stopped, the holder opened and rethreaded by hand from the bobbins. It was a slow hand process still, but so advanced over single thread spinning that an attempt was made by the spinners to mob his house and he fled.

The economic gain was increase in production of yarn and greater ease in spinning cotton, because the cotton roving is soft and the slackened fibre in the holders when it was attached to the spindle caused less breakage. The defects were in twisting which was not so hard as the old single thread method. It gave, however, an impetus to cotton spinning.

The first successful roller spinner was promoted by Richard Arkwright, an English barber of mechanical bent. It is probable that he saw the roller machine of Wyatt and Paul and commercialized it. It was not primarily his invention, but an adaptation of theirs which he organized and for which he was knighted. It is said that his factory or

ganization is the foundation of the modern English factory system. His ability lay not so much in inventiveness as in systematic assemblying of both men and mechanical possibilities. His machine was too heavy to be driven by hand power so mules or horses were first used. Later, water power, from which the Arkwright spinner takes its name of water frame was employed, and finally steam, in 1790. The principle of the machine is a double set of twin rollers, the second set revolving more rapidly than the first. The first slow set of cylinders received the roving, passed it to the second set which moved faster, drew it to a uniform thickness, laid it parallel and rolled it off into the spindles which twisted it and wound it on the bobbins. Arkwright built the first cotton mill in the world at Nottingham where his machine was operated by horse power. In 1771, he employed water as a motive power in his mill at Cromford. He built numerous small factories through England in which he pioneered in performing all the operations in textile making under one roof.

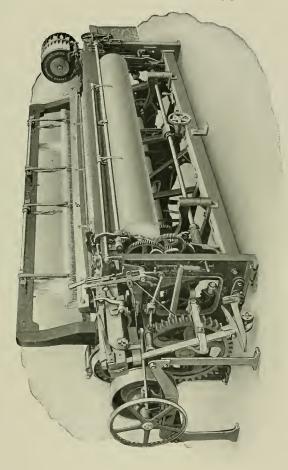
The economic advantage of his water frame was a hard twisted thread. It is said that previous to the water frame there had been no way of spinning cotton hard enough to use for the warp. With the increase in spinning facilities there grew a necessity for

carding more quickly. John Leigh or Lees, of Manchester, improved on the Paul carding machine by inventing a mechanical feeder called an apron feed. The economic advantage was the elimination of one man in running the carding machine and the increase in output because the process was continuous. The output, however, was in short slivers like the hand cards. Arkwright made a carding machine which fed the fibre in flat and wide. The machine rolled it into a cylinder which in revolving formed a sliver. The economic advantage was a longer sliver. Arkwright and Hargreaves both invented a doffer cylinder to take off or strip the fibre or roving from the carding machine. Thus in 1774 all the principles of carding were inaugurated and modern carding is only a perfection of these methods.

Samuel Crompton in 1779 combined the Hargreaves and Arkwright spinning machines. Some authorities believe that he invented the roller machine independently. Necessity has ever been the mother of invention. An invention does not drop from the skies into a man's brain ready born. The need of the invention arises in the world, and many men work out their conclusion to the need. One man succeeds above the others

at times, and again, several may nearly duplicate each other's contrivance. So with Crompton. He said that his mind was constantly occupied for four years with the desire to so improve the Hargreaves machine that the thread would not break. The re-

muslin in trade. He attempted to gain a grant from Parliament for his discovery but experienced many vicissitudes. The spinners attempted to break his machine and at one time he took it apart and hid it. His apprentices finally gave his invention to the spinning



Automatic Northrop Loom (Courtesy of the Draper Company)

sult was an automatic adjustment of the Arkwright rollers so that the carriage with the spindle receded at the moment the rollers delivered the thread. In this manner the thread was lax for a second or two before the strain of winding it on the spindles. The economic advantage was the ability to spin very fine threads and compete with Indian

public and the spinning industry in England was greatly aided. At first the machine was called the muslin wheel, then the Hall-inthe-Wood, from his estate, and finally the mule because it was half spinning-jenny and half water-frame.

Dr. Edmund Cartwright in 1785 introduced the first loom that could be automat-

ically stopped when a thread was broken. The warp was set up perpendicularly, the shuttles were released by a heavy spring and the reed fell with great length by releasing The whole was controlled by a crank and moved so heavily that two men were needed to run it. In saving of labor, a horse was used as a motive power, later, water and steam. The Cartwright power loom is the ancestor of the modern power loom of today. The weavers of the eighteenth century feared it would deprive them of their living. The promoters of industry, however, saw its value and adopted it, although they did not finance Cartwright. He finally however, received a grant of 10,000 pounds from the Government.

As the Cartwright loom was the English loom, the Jacquard loom is the French loom, and in itself can weave more elaborate patterns. The difference is primarily in the arrangement of the harness. In the English loom, the harness is worked by a tread under the loom. On the Jacquard, it is worked by hooks above the loom. Each harness cord has an eye through which a thread of warp passes, and each cord is attached at its further end to a hook, which raises the cord and thread. Weights attached to the lower end of the cord pull the thread back into place when the hook is again lowered into position. The advantage is that each thread in the warp is manipulated separately and an infinite number of patterns can be introduced. Later inventions placed on the English loom as auxiliaries to the harness make it possible for either standard variety to be successfully used in modern manufacturing.

During this early period of the textile evolution, the United States was very busy colonizing, and later with her Revolution and the War of 1812. For the most part her industrial history was one of agitation for home industries and the establishment of mills equipped either with English machines or their copies. When her equipment became complete so that she could supply her actual need of cloth and yarn, her mechanics turned their skill to improving the English machines and adapting them to the needs of this country. Her industrial history is largely a history of improved methods or appliances. Such, for instance, was Paul Moody's substitution of leather belts in place of iron gear for transmitting motion which he introduced in the Lowell Mills in 1826.

Another was the compound gear, an invention of Asa Arnold, of Rhode Island, in 1823, which was the introduction of the differential motion in the roving frame. Still another was cap spinning, which revolution-

ized the industry for a time. It was invented by Charles Danforth of Paterson, N. J. The spindle is stationary but revolves on itself like a top, balanced by its own speed. The bobbin moves up and down rapidly, only restricted by the spindle cap. In 1871, Jacob Sawyer, of the Appleton Mills at Lowell, devised an improvement in the bobbin with an economic advantage of a steadier, faster motion.

This list of adaptations and improvements could be continued indefinitely in the history of American efficiency and they are still going on today. The greatest inventions which the United States gave the textile world are the cotton saw gin, the ring spinning frame, the automatic loom and the sewing machine.

The cotton saw gin was invented by Eli Whitney in 1793. He was a Massachusetts man whose father made and mended tools and violins. At the time of the invention, Eli Whitney had been graduated from Yale and was tutoring in the South to earn money to go to law school. While in Savannah a a chance remark about the tediousness of picking cotton by hand led him to try to make a machine which could do it quickly. The negroes clawed the seeds out with their fingers and the "stint" was two pounds a day. The saw gin as it was called, is a cylinder covered with wire teeth which rotate against an iron mesh from which projects the cotton. The teeth catch the loose cotton fibre, drawing it through the mesh while the seeds drop in the other side. A second brush roller takes the cleaned cotton from the teeth.

The South adopted the machine but refused for a long time to protect Eli Whitney so he went north again. England, where much of the cotton was sent for weaving, promulgated the theory that the cotton fibre was injured by the teeth so that it broke easily. In 1800, however, the Southern planters finally recognized Whitney's rights to his invention and eventually awarded him \$50,000. North Carolina and Tennessee taxed every user of the saw gin for five years and this annuity was paid to Whitney for a time. In 1812, however, the government refused to renew his patent and he turned his skill to the manufacturing of fire arms.

Ring spinning was invented by Richard Roberts in 1835. It is the first effort to draw the roving, twist and wind it in one process. The bobbin is firmly attached to the spindle which twists. The spindle passes through a loose ring without touching it. A movable traveller is attached to the spindle; the yarn

passes through this traveller on its way between the roller and the bobbin, and the drag of the yarn through the traveller as it revolves, winds it.

In 1839 was perfected an important invention—the Bigelow carpet loom—the first power driven device to weave carpets successfully. The inventor, Erastus B. Bigelow, and his work are mentioned at some length in Chapter IX of this book and in the article regarding the Bigelow-Hartford Carpet Company. Other inventions for use in the manufacture of carpets are also described

in the same chapter.

The Northrop loom was invented by James Northrop in the Draper Mills between 1890 and 1895. The Northrop loom is the perfected loom over which he worked for some years. It supplies filling, also a bobbin to its shuttle, threads the shuttle and uses the warp stop-motion, performing all of these processes automatically. The economic gain is the ability of one man to leave the loom because it does not require all his attention, and also the saving in waste since it automatically stops in case of a broken thread.

The sewing machine takes the textile industry a step beyond the production of cloth and begins the production of garments. Because of its value in labor saving in the completed product, however, it is sometimes

mentioned as a textile machine.

The intention of the inventors today is not to build new machines and thus incur too great an expense for successful competition. The modern inventor desires to perfect the known machinery so as to increase speed, decrease stoppage time and eliminate waste, both in man power and material. During the Industrial Revolution, the motive power changed from hand and horse power to water power. Towards its close it became

steam power. With the latter change the textile centers shifted somewhat from water ways to the proximity to coal supplies. At first carding, spinning and weaving mills were differentiated. Later they came under one roof, but a different steam engine drove each machine or set of machines.

Recently electricity has been introduced and in many cases a central power plant runs all departments. The manufacturer is saved not only the expense of several competent engineers but the current is so interchangeable that if any accident occurs in the power plant the office can choose which departments are most necessary to run and the current can be directed to those departments. The advantages to the manufacturer are the elimination of expense in fuel and engineers and the ability to run any part of his factory at any time. The advantages to the employee are the increase in salary to the competent engineer and, in case of accident, the saving time and consequently the earning capacity of the artisans who run the machines. Every department or even every machine in a department does not have to be shut down when an accident occurs in the engine room.

INVENTIONS OF IMPORTANCE

INVENTIONS OF IMPORTANCE				
A Chronological table	of some early in	ventions:		
1589 William Lee	Knitting Frame	England		
1650 M de Gennes	Loom	France		
1724 Vaucanson	Swivel Loom	Holland		
1733 John Kay	Fly Shuttle	England		
1738 { Lewis Paul } John Wyan	Roller Spinning	England		
1748 Lewis Paul	Carding Machine	England		
1764 James Hargreaves	Spinning Jenny	England		
1760 Robert Kay	Drop-box	England		
1769 Richard Arkwright	Water Frame	England		
1779 Samuel Crompton	Mule	England		
1785 Edmund Cartwright	Power Loom	England		
1785 Edmund Cartwright	Carding Machine	England		
1793 Eli Whitney	Cotton Gin	United States		
1804 Jacquard	Jacquard Loom	France		
1831 John Sharp	Ring Spinner	United States		
1839 Erastus B. Bigelow	Power Carpet	United States		
	Loom			
1000 1 N	Automotic Loom	United States		

CHAPTER FIVE

THE GREAT COTTON INDUSTRY OF THE UNITED STATES. GROWTH OF MANUFACTURING AND THE PLANTS DEVOTED TO COTTON WEAVING. SELLING AND MARKETING OF THE PRODUCTS OF THE COTTON MILLS.

Study of the growth of the cotton manufacturing industry in the United States reveals a most interesting spectacle of industrial development as dependent upon the conditions of labor supply, raw material supply, and the invention of processes. As early as the middle of the seventeenth century, raw cotton was imported into New England from the West Indies to be spun by hand into yarn. So long as Great Britain controlled the American colonies, little progress was made in manufacturing because of the scarcity of labor and capital. Moreover, Great Britain was careful to prevent the export of machinery so as to confine textile manufacturing as much as possible to the British Isles. After the Revolutionary War, industry was allowed to follow the course of free development.

The first successful venture in cotton manufacturing was launched in 1790 in Rhode Island under the direction of Samuel Slater, whose work is described in some detail in Chapters I and III of this book. From memory he drew plans for the construction of machinery and thus gave the cotton industry in this country its real birth. Progress during the first decade was extremely slow, due to severe competition from English manufacturers and also because New England capital and labor were interested chiefly in agricultural, shipping, and

foreign trades.

During the next war with England, the absence of foreign goods from the American market created a period of extremely high prices and this attracted much capital for investment in the lucrative cotton manufacturing business. Many capitalists who found their business in foreign trade interrupted by the War of 1812, diverted their attention to the promotion of cotton manufacturing. Thus, although in 1805 this country had only 4,500 spindles in cotton mills, by 1825 there were 800,000 spindles. Immediately after the War of 1812, there was a period of stifling competition with goods manufactured in England and prices declined to levels which menaced the industry, but the American manufacturers had at their command two circumstances which enabled them to compete successfully with these unfavorable conditions.

In 1814, the power loom was invented which greatly increased the efficiency of the cotton mill and by 1825 almost all of the cotton cloth woven in America was on power looms. The second factor was the remarkable growth of the American cotton crop which enabled large scale production of cheap cloths which were being bought freely by a population growing ever more numerous and more wealthy. By 1860, there were almost 1,100 mills in the United States, equipped with 5,200,000 spindles and consuming over 400,000,000 pounds of cotton. A study of statistics shows that the growth of the cotton industry after 1840 was accomplished by the enlargement of existing establishments and an increase in the consumption of the power spindle. Many of the small mills passed out of existence and cheapness of product was attained through remarkable advances in the efficiency of production.

The early growth of the industry was centered largely in New England, and although in these times some plants were constructed in the Middle Atlantic States, nevertheless, New England with its ample capital, plentiful water power, and population characterized by Yankee thrift, proved the most suitable location. Considering the distribution of the cotton manufacturing industry in 1860, geographically, there were more mills in New England than in all the other sections of the country combined. The industry was concentrated most intensely in Massachusetts and Rhode Island, which contained respectively thirty and eighteen per cent of the total number of spindles in the country.

Providence, Rhode Island; Fall River and Lowell, Massachusetts; and Manchester, New Hampshire, were made great by cotton manufacturing. In the Middle Atlantic States, Philadelphia was the greatest single center. Yankee energy applied itself to the improvement of processes and to the power loom soon added the ring spindle. Machinery was developed which might be run

at great speed with motions automatically controlled so that the output per unit of labor was extraordinarily increased. James Montgomery, who before coming to America was engaged in manufacturing in England, wrote in 1840 that "the factories at Lowell produced a greater quantity of yarn and cloth from each spindle and loom (in a given time) than was produced in any other factories, without exception, in the world." American manufacturers next ap-American manufacturers next applied themselves to the problem of increasing the number of looms cared for per unit of labor and in 1860 the average number of looms per weaver was four as against two in Great Britain. Wages were accordingly higher in this country because of the increased production. American manufacturers greatly outstripped their English rivals came a period of high protective tariff which stimulated the production of fine and fancy goods.

After 1860 the cotton manufacturing industry developed remarkably but did not expand at the same rate as in the era prior to the Civil War. New England still remains the largest center but its predominance is The Middle Atlantic States are also comparatively less important, while the South has made remarkable strides as a cotton manufacturing section. In 1860, New England had 570 establishments but by 1905 this number declined to 308. number of spindles, however, increased from approximately 4,000,000 to about 14,000,000 which indicates the character of the industry's growth along the lines of concentration into large sized plants.



Pacific Mills in 1860

in the economical production of coarse fabrics, although in the production of fine goods requiring patience and skill the European manufacturers held first place. Prior to 1860 the cotton cloth produced in the United States was mostly for the domestic market. The export trade was not very large, most of it being in plain cloth that was

shipped chiefly to Asia.

The industry had reached a very prosperous condition, when the Civil War broke out which not only disturbed the supply of raw material and labor but also diverted capital because of the impossibility to continue large scale production. For five years the industry was almost stagnant, but afer 1865 the revival was rapid and continued along the lines of large scale production which marked its earlier development. An era of high wages and unskilled immigrant labor spurred on the American manufacturer to develop labor-saving devices. After the war

After 1880, numerous mills began to spring up in the South and for a while New England's supremacy was seriously threatened, but by rigid economizing and careful readjustment, the mills were able to maintain a successful existence. In its early history, the location of cotton mills was determined by the facilities for water power. This accounts for the rapid development of the industry in such cities as Fall River and Lowell, Massachusetts; Nashua, New Hampshire; and Lewiston, Maine. Subsequently, the introduction of steam power made less important the necessity of locating near a fast flowing river. At Lowell, a system of canals has been constructed so that the Merrimac River flows through the heart of the city in such a way that the water is used by one mill after another. Canal systems were also constructed in Lawrence and Manchester. In 1900, nearly half of the power supplied to cotton mills in Lowell and Manchester,

and one-third of the power supplied for cotton mills in Lawrence, Massachusetts, was

furnished by water power.

The remarkable growth of the cotton manufacturing industry in Fall River, New Bedford (a Massachusetts city which developed in textile manufacturing later than some others in New England), and Providence, however, cannot be ascribed to water power sites alone. It has been pointed out that these tide-water cities gain advantages from transportation rates. This does not apply to freight rates on raw cotton and finished goods because the rail and water rates are practically the same for raw cotton, and the shipments of finished goods south and west can be made at practically the same rates from most of the large points of New England. Where the mills located at tidewater points gain appreciably is in the cost of coal because the freight saving by water transportation is considerable. As the utilMiddle Atlantic States diminished from 340 to 204. The industry, measured by the number of spindles, has remained practically stationary in these States. Philadelphia is the point of concentration for the industry in this section. Here have developed numerous small weaving establishments which do not spin their own yarn. The average number of looms per mill is about 100. lmmigrant labor from Europe was early employed in the Pennsylvania district and this introduced some characteristics peculiar to the European industry. Imported traditions fostered the manufacture of fine and fancy cotton fabrics. The Middle Atlantic States lead in the production of cotton knit goods and in New York and Pennsylvania are some of the largest knitting mills in the United States. At Cohoes, N. Y., the water power of the Mohawk valley fostered the growth of a great underwear manufacturing industry, while the settlement of Germans in



Panoramic View of Amoskeag Manufacturing Company from West Side

ization of steam power became more widespread, the mills located in waterfront centers reaped proportional advantages.

Another reason to which is ascribed the rapid development of cotton manufacturing in seaboard cities is the climatic condition. Humidity has come to be recognized as an important factor in the processing of cotton and the moisture of the atmosphere in such cities as New Bedford is a great help in obtaining the desired results. In recent years, these conditions have been artificially duplicated where needed in the mills in various parts of the country through humidifying systems.

It is also supposed that the decline of the great whaling industry in New Bedford left free great sums of capital to be invested in other fields and these were diverted into cotton manufacturing. It is significant that the ownership of some of the largest mills in New Bedford is now in the hands of families whose fortunes were made in the prosperous days of the whaling industry.

After the Civil War, the number of establishments for cotton manufacturing in the Philadelphia developed great establishments devoted to the production of hosiery.

One of the greatest industrial changes noted in our country after the Civil War was the development of cotton manufacturing in the Southern States. After the abolishment of slave labor, interest quickened in industrial enterprises and results were accomplished which characterized the achievement of a free competitive and industrial community. In 1880 the North had twenty times as many spindles as the South, but by 1910 the northern equipment was but fifty per cent greater. During these thirty years, the North gained about 7,000,000 spindles while the South gained over 10,-000,000. More than one-half of the southern increase took place after 1900. three southern States in which the construction of cotton mills has centered are North Carolina, South Carolina, and Georgia. Alabama also has a considerable number of mills.

There are many reasons advanced why the South has been so successful in developing its cotton manufacturing industry. The first that is most usually presented is the saving in freight on raw materials. This can hardly be considered as a potent factor because many of the mills receive their cotton from a considerable distance and the discrepancy of rates as compared with New England is not a decisive one. However, where southern mills obtain their cotton locally, they receive it in loose ginnery bales and they save on charges for packing. Such a mill does not have to pay charges for com-

adaptable to its purpose and being obliged to sell the unsuitable grades. As regards the bleaching, dyeing, and marketing of cotton goods, the North has a distinct advantage. The South has no favorable sources of suitable water supply for the maintenance of dyeing and bleaching plants. After the cotton is manufactured, the grey goods must be shipped north for finishing and then they are forwarded to New York to be marketed.



Old Time Mill Yard Scene, Amoskeag Manufacturing Company

pressing bales. In addition, these mills are all located near the source of supply and there is no necessity for keeping tremendous quantities in warehouses at points distant from the source of production as is the case in New England. It requires the use of capital and storage for the warehousing of cotton for mills which are located far from the source of supply of their raw material. One mill has even tried the plan of receiving cotton directly from the field and ginning it itself. This has proved unsatisfactory because it must receive several grades of cotton from the grower which the mill must sort itself, utilizing only those sorts which are

The fact that the southern cotton manufacturer is close to the supply of his raw material is of doubtful value in the development of the industry in the Southern States. The world's cotton market is ruled by the New York quotations and the saving in freight would in itself hardly be a sufficient foundation for growth. There have been many instances where southern municipalities have fostered the promotion of cotton manufacturing by granting exemption from taxation. In many instances, however, the benefit of this privilege was offset by the fact that the southern mill owners often had to provide sanitary betterments and lend fi-

nancial aid to schools and churches in the villages. Although these above-mentioned factors were of some advantage, the real foundation of the growth of cotton manufacturing in the South should be attributed to a plentiful and manageable labor supply. The cotton loom operators were drawn from the mountain-section inhabitants.

Many cotton manufacturers in the North, seeing the development of the South, have established plants in the Southern States in order to protect their business in the event



HON. SAMUEL BLODGETT

that the North should be outstripped by its competitor. Many New York selling houses have invested money in southern mills. It is true that in general the southern manufacturers have derived some measure of benefit from being close to the cotton fields, from water power, from comparatively easy taxation, and from long hours for labor.

On the other hand the North has had access to more plentiful supplies of capital and credit, greater convenience for the employees, better trained workmen and highly skilled executives, geographical centralization of the industry, more suitable climate and proximity to the finishing works and distributing markets. The supply of cheap labor which has been one of the main advantages of the southern manufacturers is growing to be comparatively less a factor, because wages are slowly tending to rise

in the South as the supply of native whites is being diminished and immigration fails to be attracted by low wages. During the dull business period from 1893 to 1897 the North felt severe competition from the southern manufacturers, but in the subsequent business revival there was enough prosperity for both North and South to share, and when the next depression came the South was as hard hit as the North. Highly improved organizations and advanced selling methods found the northern manufacturers this time in a much stronger position, until now the fear of a southern conquest has been almost entirely eliminated. Witness to this fact are the numerous large undertakings that have been promoted in recent years in New England. It can be said fairly that this competition between the North and South in cotton manufacturing has been of great benefit in advancing the interest of the country and has made both sections more progressive and more prosperous.

PROCESS OF MANUFACTURING

Outrivalling by far the wonders of ancient magic is the series of mechanical processes by which a bale of raw cotton is converted into superbly finished fabric. Various ma-

chines are used in doing this.

As the bales come from the warehouse to the mill, they are opened and the cotton is put through a machine known as a bale breaker. The great compression which has been applied to the cotton in forming the bale causes the fibres to be closely matted and this initial process is for the purpose of working up the fibre into a loose state. Workmen split the iron band of the bale and take out huge armfuls of cotton and throw it onto a traveling apron which carries the cotton into an enclosure known as the hopper. Here it passes between rollers surfaced with spikes which tear apart the closely matted lumps. Before the cotton enters the opener, one may notice pieces of foreign material such as pebbles, sticks, seeds, etc. which have been left from the ginning. A part of these impurities falls to the bottom of the hopper. The cotton emerges from the back of the hopper in a loose state and is carried by a traveling lattice to large bins where it remains for several days. Each kind and grade of cotton is accumulated in a separate bin. In the processing of cotton every precaution is taken to eliminate thoroughly any pieces of metal. Cotton is highly inflammable and the presence of even a small wire may cause a spark from friction with the machinery and be the ultimate result of serious damage.

In fact, protection from fire is most carefully sought after in the mill. In the modern plant, fire extinguishers and hose connections, automatic sprinklers and other devices are installed throughout.

From the bins the cotton is taken for the next process called opening. The opener is a machine several yards long with closed chambers and broad rollers. The cotton enters the opener on a moving lattice and leaves it in the form of a flat sheet called a lap which is about half an inch thick and between three or four feet broad. These laps are wound around rollers. The closed chambers of the opener contain rapidly moving

from much of the dirt and foreign material and also to open it up into a loose, fluffy mass containing no hardened or matted fibres. The carding machine not only continues this process but also makes a beginning of placing the fibres in parallel positions so as to render them suitable for twisting and spinning into thread. The main part of the carding machine consists of a large cylinder covered with strips of canvas cloth in which have been placed very closely together (about 600 to the square inch) fine, sharply pointed steel wires about one-quarter of an inch long. This wiring is known as card clothing and the whole surface of a



Lowell in 1825

(From an old painting presented to the Hamilton Manufacturing Company, Sept. 9, 1886, by Mrs. Alanson Crane) The Structure at the Left with the Tower is the Hamilton Manufacturing Company. The Large House at the Right was the Residence of Kirk Boott. The Pillars of the House are a Part of the Construction of the Lowell Corporation Hospital

knife blades which separate the cotton thoroughly and shake out the dirt, seed, and bits of grass. A current of air pulls the cotton onto hollow cylinders, the surfaces of which are perforated so that the air current passes through and leaves the cotton on the outside. The cotton in being removed from these rollers is manipulated into a lap.

After leaving the opener, the cotton passes on through a scutcher which is simply a machine for reworking the cotton and recleaning the laps issuing the material forth again in the form of a lap. The rolled laps, weighing about forty pounds each, are taken from the scutcher to the carding machine.

The functions of the bale breaker, opener, and scutcher have been to free the cotton

cylinder may contain between three and four million wire points. The upper surface of the cylinder comes in contact with a series of flats which are endless chains covered with card clothing and moving in the same direction as the cylinder but at a slower pace. The wire clothing of the flat comes very close but does not touch the clothing of the cylinder. The laps of cotton are fed through rollers to the wire clothed cylinder which carries the cotton upwards until it passes between the surface of the cylinder and the surface of the flats.

Both sets of surfaces clothed with wire move in the same direction, but as the cylinder surface moves faster than the surface of the flats, the result is that the wires of the cylinder carry the cotton past the wires of the flats, and the latter, catching the cotton and retarding its progress, gradually work the fibres into a parallel position. As a result of this manipulation between the two wire clothed surfaces, both moving in the same direction but at different rates of speed, the cotton which entered the carding machine in laps one-half an inch in thickness is now seen to emerge from the rear of the machine as a thin, filmy gauze not more than one-hundredth of an inch thick, very white and clean. Almost all of the dust has been thoroughly shaken out and the card cloth-



HON. EZEKIEL A. STRAW Mill Agent of Amoskeag Manufacturing Company From Dec. 26, 1856 to Dec. 23, 1878

ing has kept back the small and broken fibres.

This thin gauzy web, several feet broad, now moves on through a trumpet shaped cylinder in which it is narrowed down to a breadth of about an inch. This narrows strand of cotton then passes along through a hole and into a cylindrical can about three feet high and ten inches in diameter and by a mechanical movement given to the cover, the strand is neatly coiled around until it fills the can. The ropelike strand of cotton coiled in the carding can is termed the sliver.

The next process is performed by the drawing frame. Many cans containing slivers are brought up to the frame and are fed to its series of rollers. Six slivers are drawn

in a series between four pairs of rollers and issue on the further side all combined in one single sliver which is no greater in thickness than each of the separate six. The frame has drawn out and compressed the fibres to accomplish this result. At this point the slivers pass through four pairs of rollers, the second pair revolving faster than the first, the third faster than the second, and the fourth faster than the third. As each pair revolves faster than the preceding pair, the result is that the sliver is retarded by the set of rollers from which it emerges and this continual pulling motion draws out the fibres. thins the slivers, and eventually allows six of them to be combined in a single sliver of no greater thickness than the original one. Should the sliver happen to break in the process of drawing, the machine automatically stops through a delicately adjusted controlling device. After the slivers have emerged—six in one, so to speak—six are again put through the drawing frame so that the sliver which now emerges contains thirtysix of the original slivers. This process is repeated until the final sliver contains two hundred and sixteen of the original ones. The drawing machine not only developes the work of the card in laying parallel the cotton fibres, but by drawing and combining large numbers of slivers, it works out any unevenness of thickness that might exist in the original slivers so that the final ones are drawn out straight, uniform, and strong.

From the drawing frame, the sliver passes over to the flying frame or slubber wherein the drawing and doubling process is continued and the sliver is given a slight twist and wound around a spindle. After receiving the twist, it is called no longer a sliver but The slubbing is then again drawn out, doubled, and twisted, and then passes on to the roving frame. The rovings are similarly drawn out, doubled, twisted, and wound upon spindle tubes. The spinning process then converts the roving into a fine, white hard, twisted varn ready to be woven in the loom. There are two processes of spinning, mule spinning and ring spinning, each having its adherents. Mule spinning is an intermittent process while ring spinning is a continuous one. The claims of a larger output per operator by advocates of the ring spindle are offset by the claims of a softer and better yarn made by the adherents of the mule spindle.

The cotton yarn may now be sold to a weaver or used for weaving in the mill in which it has been spun. Before the yarn is utilized in the loom as the warp structure of the fabric, it is usually impregnated with

what is called a sizing. This smooths out and sticks down the furry surface and adds to its tensile strength. The process of sizing is accomplished by passing the yarn around a roller of what is called a slashing machine the bottom surface of which revolves in a bath containing the sizing solution. After the yarn has been dried, it is again wound up and ready for the loom. The loom is a machine which interlaces textile yarns lengthwise and crosswise so as to produce a closely constructed fabric. The lengthwise threads are called the warp and the crosswise threads the weft or filling. By a series of automatic movements and intricate controlling devices, the threads are woven into almost numberless combinations so as to give various effects on the surface of the fabrics.

The cotton has now left the loom in the form of cloth and before it is ready for marketing must go through several processes such as bleaching, printing, mercerizing, and dyeing. As the cloth comes from the loom it is known as grey goods because it is of a dull grey, yellowish color containing impurities picked up in the process of manufacture and some of which still remain from the original raw cotton. The sizing is also a contributory cause of this color. The bleaching of cotton has for its purpose not only the whitening of the fabric but also the removal of greasy impurities. This involves boiling the grey goods in plain water to eliminate soluble substances boiling in an alkaline solution to saponify the greasy matter; then soaking in a bleaching solution, usually chloride of lime, to whiten the fabric. Finally it is treated in a mild acid bath to neutralize any alkaline residue. To obtain a very smooth surface, the fabric is even singed. This process consists of passing it rapidly over a series of gas jet flames which burn off small fuzzy fibres protruding from the surface. This singeing is sometimes accomplished in the yarn.

MARKETING THE GOODS

The marketing of cotton goods has given rise to a specialized organization entirely distinct from that which directs the manufacturing processes. There is a variety of channels through which the cloth production of the cotton mills is carried on to the ultimate consumer. These methods depend upon the organizations of the manufacturing plants and their product. Some have large organizations completely equipped which spin, weave, dye, and print the cotton goods so that they have a finished product to offer in the market. A large number of mills do

spinning only, and sell their yarns to weaving establishments which do not do their own spinning. Many mills specialize on one type of cloth, coarse or fancy, aiming to make their profit through efficiency in operation and by specialization. There are numerous plants which specialize on grey goods as their ultimate product. They do not attempt to bleach, dye, or finish the cloth, but leave these operations to be performed by others who specialize in those particular fields

In the past, by far the greater portion of its output was sold by the mill to jobbers or



THEOPHILUS PARSONS
President and Trustee of the Amoskeag Manufacturing Company from 1911 to Jan. 4, 1916

wholesalers of dry goods. The jobbing houses resold in smaller quantities to the retailers who then sold to the household consumers by the yard. In recent years this practice has diminished to a certain extent so that now a smaller portion of the mills' output goes to the dry goods jobber. Large sales of cloth are now made directly by the mills to the big cutting-up establishments which manufacture all forms of cotton apparel for the public such as shirts, overalls, pajamas, etc. It is very common for the needs of our large retail establishments to be so extensive that they can order in large quantities directly from the mill at distinct savings in price. Usually mailorder houses are able to dispose of such great quantities of cotton products that they make their purchases directly from the mill. In addition to these forms of organizations which distribute the manufacturers' product for domestic use, there are large export houses which specialize only in foreign markets and distribute the products of our manufacturers into every country of the globe where there is a demand for cotton goods.

The converter adds an important link to the chain of trading processes by which the cloth travels from producer to consumer. The converter buys grey goods from the mills. It is his duty to study the public demand for any particular style of finished fabric. He keeps in close touch with the retail situation and is constantly learning from clothing manufacturers what is the trend of

marks for their brand of goods and created steady markets by advertising.

Then there is a class of operators known as cloth brokers. The broker carries no merchandise at all. It is his duty to know what establishments are in the market for cloth and what their needs are in yardage and quality. The broker always keeps himself thoroughly informed on the offerings of the mills. It is his busines to know what mills are "all sold up" and have no goods to offer and also what mills are in need of business and in a position to supply cloth. He is in regular correspondence with the mill men, who may advise him daily, as to what quantities and qualities of goods they have to offer and the prices. The broker combs the consuming trade and finds out who needs cloth, or he may receive an order



Boott Cotton Mills in 1852

the public demand. After having studied out what kind of fabrics could be most easily sold, or having received orders for some, he ships the grey goods to bleaching, dyeing, and printing establishments to be finished in styles and patterns according to his instructions. He then receives them from the finishing plants and proceeds to market them according to his previously formed plans. The business of converting requires a large capital because the mills sell their grey goods on practically a cash basis, and the converter must carry the stock from the time it leaves the mill through the finishing processes to the day of marketing, and then he may extend credit to the party who buys the finished material from him. Converters sell to almost every class of trade, namely, jobbers, apparel manufacturers, and large retailers. In many instances converters have established tradefrom a cutter to buy for him a certain quantity and quality of cloth. The broker effects these sales and receives a percentage commission on all transactions consummated. Thus, the average buyer of cloth can supply his needs more advantageously through a well informed broker than if he took the time to go out and cover the market himself in order to locate the exact material that he needs.

Many of the large mills have their own sales forces in the cloth markets. It is only those mills which have a large output that find it profitable enough to go to the expense of building and maintaining a sales organization to handle their products exclusively. In addition it requires huge financial facilities to carry out this policy successfully. If a mill is to buy its raw material, manufacture it through every process, and then market the cloth itself, it un-

dertakes the swinging of a transaction which may require almost a year's time for completion, that is, before it receives the cash or the money it has expended for raw cotton to be carded, spun, woven, and finished, thereafter to be offered on the market by its own selling agency and sold to a jobber or a cutter on a credit basis.

The fact that few manufacturing firms have sufficient capital to finance the direct selling of their output has fostered the development of the large commission houses known as factors. In a certain sense a

these advances of money against the shipped merchandise. Through advantageous bank connections, a banker, a specialist in finance, sales, and salesmen of cotton goods, the factor obtains his money at a wholesale rate something under that which he charges the mill and this gain, arising from his transactions of credit, constitutes a considerable part of his profit. In many instances the factor will provide the business with storage facilities, a sales room, and an energetic selling staff, which offers the mill's merchandise in all the markets of the country. His sales-



View of Lawrence, Mass., Showing in Background Duck Mill, Pemberton, Bay State and Pacific Mills

factor is simply a commercial banker. The factor undertakes to sell the products of the mills, because he is financially able to carry large stocks of merchandise, or if he prefers that the mill carry the merchandise, he advances the money for this purpose.

The usual relation between the factor and the mill is as follows: Immediately after the mill has made a shipment of merchandise, it can draw against the factor a sum representing a previously agreed percentage of the value of the shipment. This advance is usually about two-thirds of the selling value of the goods. The factor charges the mill interest at the prevailing rate for

men report the trade conditions and the trend of public demand, and the mill keeps in close touch with its factor to learn what goods are most profitable to manufacture because of a ready demand. The selling prices of the merchandise are fixed by the mill and as soon as the goods are sold, the mill is credited with whatever balances are left, deducting previous advances and charges for interest. The factor also guarantees the credits of the concerns to which the mills sell. He makes up any loss which the mill may incur on bad debts arising from sales put through by the factor.

CHAPTER SIX

DEVELOPMENT OF THE WOOLEN AND WORSTED INDUSTRIES. THE MAK-ING OF THE FABRICS.

Four separate periods mark the growth of American woolen manufacture as distinguished from worsted manufacture. colonial times, as mentioned in a previous chapter, the preparation, spinning, and weaving of the wool was done in the households by the women members of the family. The transition from the household to the factory basis was very slow. The early woolen manufactories were merely shops where persons obtained work in carding and fulling, and their pay was usually a portion of the product which they worked up. The factory organization of woolen manufacture was first started in Byfield, Mass. It spread to other New England points so that by 1810 a very considerable proportion of the wool manufactured in the United States was produced in factories. The next step consisted of the general adoption of the factory system. The plants were operated on a moderate scale, usually small mills situated near a stream and operated by water power. The third and perhaps most important stage of growth was during the Civil War period when the tremendous demand for military goods was a powerful stimulant to the industry. During this period there was a great increase in the number of mills and also in the variety of fabrics produced.

The fourth period was one of scientific organization in which the industry was developed along the lines of large scale production. Many of the small mills were put out of business by the powerful competition of larger combinations. During this period the woolen industry declined when compared with the growth enjoyed by the worsted factories. The Scholfield Brothers, between 1794 and 1814, had developed nine factories throughout New England, and they successfully employed machinery which was an imitation of the English type. During the War of 1812 the embargo acts which shut off New England's foreign trade made available great quantities of capital and the executive ability of our business men was directed to other fields. They naturally turned to manufacturing.

During the period between 1810 and 1815 the value of woolen product in this

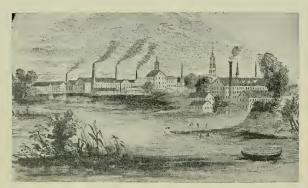
country more than quadrupled. After the war, however, these newly established woolen mills found it impossible to compete with the great quantity of British woolen goods which were shipped over to this country, in spite of the fact that in 1816 a protective tariff was enforced which amounted to 25 per cent on woolen goods and 15 per cent on raw wool. The English mills were long established and had made advanced steps in the process of scientific manufac-The year 1819 was a crisis-year for the American industry and is characteristic of the days of trial and distress in American business when operators put their shoulder to the wheel and applied themselves to the organization and invention of processes that would enable them to withstand the adverse condition by which they were beset. By 1828 the industry had displayed splendid power of recovery. The looms now began to be operated by power and in addition to being established on a sound basis, considerable more protection was afforded in 1828 by a substantial tariff.

The tariff of 1828 applied a duty on wool of 30 per cent ad valorem except for wools valued at less than 10 cents per pound, upon which a tariff of 15 per cent ad valorem was applied. Woolen goods were protected by a 40 per cent tariff during the first year and in 1829 the duty was 45 per cent. From this time on to the Civil War the woolen industry experienced an orderly and conservative growth, until in 1859 there were 1260 woolen mills in operation throughout the country with an annual product valued at \$61,800,000. The Civil War fostered the tremendous demand for blankets and cloths for army uniforms and in 1869 the country had 2,891 woolen mills with a product valued at \$155,000,000. Since the Civil War there has been a steady decrease in each decade in the number of plants devoted to the production of woolen goods and within the last two decades prior to the recent European war the number of woolen mills throughout the country has diminished still further and the industry has become centered in a few sections. Northern New England has a considerable number of woolen mills which produce heavy cloths for overcoatings and woolen yarns for knitting, but the predominant centers are Lawrence, Mass.; Philadelphia, Pa., and Providence, R.I.

The worsted industry did not develope to any great extent until about 1850 when the introduction of modern combing processes made worsted manufacture commercially practical. Before the combing machines were introduced the worsted industry grew very fast. The worsted industry appears to have grown most rapidly at the time when the woolen industry was decreasing, thus showing that one seems to have developed at the expense of the other by monopolizing the public demand for fine and smoothly woven fabrics.

The manufacture of wool requires great skill and experience in order to manage suckinds of yarns is as follows: In the preparation before spinning, the woolen yarn is first carded. In the carding process, the fibres are comparatively separated and interlaced in a casual manner; after a thin rope-like strand has been formed with the fibres thus actually interlaced, the spinning process takes place. In the manufacture of worsted yarn, however, the wool fibres are first combed so that they lie parallel to each other forming what is called a top, which is subsequently put through the spinning process. The preparatory stages of cleaning the wool and making it ready for manufacture are the same, irrespective of whether it is to be used for the production of woolen or worsted material.

Some manufacturers purchase their wool in the grease, i. e., just as it comes from the sheep without being cleansed. When the



Lawrence, Mass., in the 50's, Seen from North Andover

cessfully the vital steps in the process. At numerous stages of manufacture many imperfections may arise and result in serious injury to the finished product. The wool manufacturer must have a wide knowledge of the various grades and qualities of wool fibres and substitutes. Numerous occasions arise where blendings of various types of stock can be cleverly effected. This results not only in savings in cost but may also be of invaluable aid in obtaining desired effects in the finished fabric. Machinery must at all times be carefully watched, or possible mal-adjustments may occur. The product may become oil-stained and the fabric damaged.

The differentiation of wool manufacture into woolen and worsted goods must begin naturally with the yarn. The essential difference between the structures of the two

bags or bales arrive at the mill they first go to the sorting room where trained workers grade and separate the various qualities of wool. The sides, shoulders and neck contain the best, and the legs the poorest. The wool is sorted out according to length of staple, fineness and general condition. It is desirable that as much dirt, sand, and foreign matter as possible be removed from the wool before it is washed. It is put through a machine called a feeder, in which the wool moves on a travelling apron and is agitated by spiked cylinders so that the foreign matter is shaken out and falls to the bottom of the chamber. dust is even more effectively drawn out by putting the wool through the dusting machine in which it is stirred about while the suction of a powerful fan draws away the impurities.

Scouring of wool aims chiefly to wash out whatever dirt still adheres after the dusting process and also to remove the greasy content of the wool which remains after shearing. This greasy matter is called yolk and has been deposited on the wool by secretion from the skin of the sheep. wool is washed in warm water containing an alkaline solution which saponifies or breaks down the grease. The washing machine is in the shape of a long narrow trough divided into tanks. In the first series of tanks, the wool is saponified in chemical alkaline solutions, and in the last series of tanks it is rinsed in clear water. Each tank has wringers which press out the water from the wool before it is moved on into the next tank. From the last wringer, the wool emerges clean, soft and white, free from dirt and free from chemicals. If the proper chemical solutions have been utilized and if the temperature of the water has not been too high, the wool fibre should not be injured by this scouring process and should retain a bright and supple condition. Various wools shrink in various degrees during the process of scouring. Some wools shrink thirty per cent in weight, while others may shrink as much as eighty per cent and the ultimate clean content of the wool after the scouring process is a factor in determining the price value of the wool while it is in the grease. Most sales of grease wool are made on a basis of the estimated scoured content and the grease price is calculated by establishing a scoured price and then figuring the shrinkage.

After leaving the scouring tanks, the wool is dried. In order that the subsequent processes may produce even results on all the stock, it is essential that the drying process be very uniform. A hydro-extractor throws off the moisture by centrifugal force, and the wool is then thoroughly dried by driving a blast of heated air through it or by passing the wool on a travelling apron through a heated chamber.

The wool has lost its greasy content in scouring, but it is essential that it possess some oily matter in order to lubricate the fibres, and facilitate the subsequent combing process. For this purpose, oil is spread on the wool as it lies in batches on the floor. This allows the fibres to slip easily through the teeth of the manipulating machines without injury to the delicate serrations which are essential in maintaining the felting property of the wool wherever any such effect is desired.

Oftentimes, after the scouring, the wool may retain quantities of burrs and seeds

which must yet be removed. To get rid of them, the wool is opened by a roller covered with teeth, and a sort of knife scrapes away the burrs while a brush takes off the clean wool from the machine. This result is also obtained by a chemical process known as carbonizing, in which the wool is placed in a bath containing an acid solution that decomposes all the vegetable matter. After carbonizing, the wool is washed in an alkaline solution to neutralize the effect of the acid and is subsequently baked to eliminate the carbonized vegetable matter. Very often the carbonizing process is used after the wool has been worked up into cloth. only advantage of the previously described mechanical method, which is not so thorough as the chemical method, is that the condition of the wool is not injured as it is liable to be after having been washed in chemicals and then baked. The wool, if it is to be used for making woolen yarn, is then carded. This process is usually done by a set of three carding machines, the purpose of which is to again clean the wool, eliminate the excessively short fibres, and to separate and interlace the fibres so as to form a broad flat filmy sheet, extraordinarily thin. From the first two carding machines the wool emerges as a filmy lap and the third machine condenses it down to a rope-like strand or roving, about an eighth of an inch in diameter. The rovings are wound on spools and are then ready for the spinning process. The desirable qualities of carded woolen yarns are the softness and felting or sticking qualities. They are, therefore, spun quite loosely. Woolen yarns are usually spun on the mule in which the drawing and the twisting are done intermittently in contrast to the continuous drawing and twisting that characterize the process of the throstle or spinning frame. The latter produces a harder and more closely constructed yarn. Where both processes are employed, the usual method is to utilize the frame spun yarn as warp and the mule spun yarn, which is softer, as filling.

In the manufacture of worsted yarn the fibres of the wool are thoroughly combed so that they lie parallel. This position of the fibres renders them suitable to be twisted into a fine, even yarn. The wool is manipulated through many processes and sometimes several days are necessary to complete the various stages for a given lot of material. The preparatory process includes carding, although this is not done as thoroughly as in the case of manufacture of woolen yarn. As the fibres used for worsted yarns are much longer, the carding process goes on at

a reduced speed in order not to tear or injure the staple. A brief description of the several essential processes by which the wool is manipulated is as follows: (1) The wool is first opened, cleared and the fibres separated by means of the carders; (2) the gilling process draws out, straightens, and doubles the strands; (3) the combing process draws out all the long fibres and lays them parallel, at the same time leaving behind the short and curly fibres which are commercially known as noils; (4) the drawing out and combining of the strands preparatory for the next step of twisting and spinning.

While the wool is being carded, it usually becomes much soiled by the oil, and it is subjected to a washing in several tanks, passing from one into the other through wringers. The very best of soap is utilized in order to retain the sound condition of the wool, and fresh water is constantly flowing into the tanks to keep the soapy solution weak. After the material leaves the card, it is put through the gill boxes which straighten out the tangled and bent fibres, put several slivers together, draw them out and repeat this process three or four times. The slivers are now ready for the comb, which more thoroughly straightens out the long fibres and carefully removes the short ones.

There are various methods of combing, but the circular comb is the most preferred. The Noble circular comb combines the work of both brushing and combing and throws the wool waste to one side. The wool leaves the combing machine in the form of The noils have been removed from the teeth of the comb by a knife-like portion of the machine. Usually after combing the top is again subjected to a gilling process; that is, it is drawn out to great thinness and length and these strands are then combined and drawn out over and over again. This drawing and doubling process reduces the top to a diameter suitable for spinning.

There are two general methods of spinning; the Bradford system oils the wool before combing and produces a smooth, lustrous yarn; the dry French spinning method uses shorter wool, considerably less oil, and produces a softer and duller yarn. Quite often some difficulty is ex-

perienced in the dry French spinning process due to the electricity caused by the lack of oil and the friction of the fibres. The Bradford system introduces more twisting into the yarn process so that a harder yarn is produced. There is not much twisting done in the French process, but it produces a soft, fuzzy yarn which is highly desirable for creating certain effects of fabric.

The yarn goes through the spinning frames on bobbins, but if it is to be dyed before weaving it must be unwound from the bobbins, done up in skeins and submitted to the dye baths. The warp yarns must be particularly strong as they serve as the frame work of the fabrics. They require closer twisting. After the cloth has been woven, there yet remains the important process of finishing. The effectiveness of woolen goods is chiefly in the finish of the surface of the cloth, while in worsted goods the effect is created by the type of weave. Both kinds of fabric rely much on color The cloth is carefully examined after it leaves the loom in order to locate any imperfection such as knots in the yarn, accumulations of threads and uneven thicknesses. Usually women skilled in sewing do this work as it requires great ingenuity to finish off imperfections in the weave without distorting the design.

The cloth, after having thus been inspected and repaired, is thoroughly washed to remove any traces of oil and dirt. In a warm closet called the fulling mill, soapy water drenches the cloth as it passes under heavy hammers and rollers. If the cloth is fulled slightly, the appearance of the weave is softened, but a complete fulling will give the fabric a soft, uniform felted appearance, so that the structure of the weave has entirely disappeared. The moisture, the heat. and the pressure of the fulling process takes full advantage of the fact that the wool fibre shrinks and the serrations in the staple allow easy felting. For this reason the cloth is loosely woven, so as to make up for the subsequent shrinking in the fulling process. There are numerous other manipulations which are employed in obtaining special effects. The final pressing out process gives the cloth a smooth, lustrous, and

even surface.

CHAPTER SEVEN

COTTON AND WOOL RESOURCES OF THE UNITED STATES. HARVESTING AND MARKETING OF THESE PRODUCTS.

Upon the production of cotton and wool. the two chief raw materials of textile manufacture, hinges the prosperity of no inconsiderable portions of the United States. The successful development of our great South is practically a history of the expansion of the cotton-growing industry and subsequently the introduction of large scale cotton manufacture. The United States is the world's chief cotton producing country and our export trade in this commodity totals millions of dollars annually. While cotton-growing requires the climatic conditions of the South, and consequently cannot be carried on successfully in other sections of the country, sheep-raising is practically country-wide. This industry enjoys a varying importance, however, in different regions, according to the availability and adaptability of the land. In the Far West the largest quantities are produced. For many years the average annual production of wool in the United States has been approximately three hundred million pounds, and as this quantity is but one-half of our annual needs, the importance of maintaining and encouraging wool production in the United States is clearly evident.

COTTON

The story of cotton is one of unlimited romance and the progress of its cultivation and manufacture is one of the most interesting chapters in the history of mankind's conquest of this globe and its resources. Cotton was first grown and manufactured in the cradle-lands of civilization, India and Egypt. To this very day Egyptian cotton is famous for its strength, length, and evenness of staple. The history of cotton is prominent in the great domestic and international political and military conflicts where the clash of economic forces, humanitarian principles, control of trade and the prosperity of nations, were the prompters of human action.

"Cotton is King"—this shout of strength and joy has echoed and re-echoed down the corridors of American history—first to bring prosperity to our South, later to be indirectly the cause of bitter internecine strife, and eventually to emerge again as the foundation of much of our national prosperity. So great was the faith placed in the advantage of raising cotton, after the cotton gin was invented, that the whole agricultural character of the South became primarily "cotton growing." Great manufacturing districts have been developed both in the North and South which are devoted to the spinning and weaving of cotton.

The peculiar physical characteristic of the cotton fibre which makes it so valuable for its purpose is its naturally twisted structure. This renders it capable of being spun to incredible fineness and its combination into heavy strands produces a remarkably strong textile product. After cotton has been worked up into cloth it proves to be a product efficiently resistant to wear and is capable of receiving attractive color combinations.

The length of the staple of the cotton fibre is one of the prime factors in determining its commercial value. American Sea Island cottons vary in length from one and eight-tenths inches to two inches. The Egyptian cotton fibres are about one and one-half inches in length in the better grades. Good Middling Upland and Texas cottons are one inch in length and the cotton fibres of India range from four-fifths of an inch to one inch in length.

The circumstances governing the cultivation of the cotton plant are highly important not only from a technically industrial point of view, but particularly from a business point of view. Trading in cotton is a highly organized operation conducted in a sensitive and speculative market. The status of supply and demand is ever changing and these changes are decisively reflected in the price fluctuations of cotton for immediate and future delivery. For instance, the government of the United States issues at regular periods, bulletins on the condition of the nation's cotton crop, and by an elaborate system of index figures indicates the percentage of normal yield to be expected for the year by the condition of the current crop at the time the information

is published. This percentage varies more or less from month to month according to the favorableness or unfavorableness brought on by weather conditions or insects which destroy the crop.

It requires from six to seven months for the development of a favorable crop. The temperature of the atmosphere must be warm; even a prolonged hot wave is of no detriment provided the crop receives plenty of moisture. The seed is usually sown during April and early May. Frequent but light showers are desirable to maintain a soft and workable soil which promotes the germination and growth of the seed. The average rainfall suitable during the growing period of the cotton plant, which extends from June to the middle of August, is from three to four inches per month. Plenty of sunshine must intersperse with the rain to foster a healthy, all-round development of the plant. The flowers begin to appear in June and the bolls ripen in August. In September and October cotton picking takes place, and during these months dry weather is essential to successful operations.

The size and quality of a cotton crop depends, therefore, on a combination of circumstances, such as the amount of moisture, sunshine, soil, and the attacks of parasitic insects. When the weather becomes unfavorable during the "fruiting stage," if there is too much or too little rain or sunshine, for instance, the cotton plant is quite liable to lose a great many of its blooms and bolls. The buds, blooms, and early grown bolls are shed in great numbers. These unfortunate developments, due solely to the caprice of weather conditions, are impossible to prevent. For this reason students of the cotton crop statistics constantly consult the reports of the weather bureau on climatic conditions in the cotton growing states.

After the plant has ripened, the next operation is the picking of the bolls from the plant. This is usually done by hand, although some experiments attaining fair results have been made in the picking of cotton by machinery. Cotton picking is light work that can be well done by men, women, and children, although the tendency is growing more and more in modern times to eliminate the employment of children of tender years. The season for picking usually lasts a little over three months. The chief obstacle of the work is its monotony and the negro labor of the South has been extensively used in the cotton fields. An ordinary hand will pick about 100 pounds of seed cotton per day.

"Dixie" has become famous in song and story. The home life and traditions of both whites and blacks are back-grounded by cotton plantations. The aristocratic southerner famed for the ample splendor of his estate and warmth of hospitality, and the negro whose proverbial laziness is surpassed only by his humor are both part and parcel of the "land of cotton."

off the "land of cotton."

The cotton gin represents far-reaching and revolutionary effects that can overtake



Present New York Cotton Exchange Building

an industry merely by the improvement of method. In 1790 the total production of cotton in the United States was little more than 3,000 bales, equivalent to 1,-500,000 pounds. Twenty years later this same country of ours produced more than 177,000 bales per year. What caused this sudden jump in production? In the early days the cotton lint was separated from the seed by hand, a todious and slow operation. The most conscientious worker could produce not more than a few pounds of clean cotton per day. In 1792 Eli Whitney, of Massachusetts, left for the South where he planned to teach school. His southern friends on numerous occasions discussed with Whitney the great handicap from which the cotton industry was suffering because of the slow and expensive method in vogue for the separation of the cotton from the seed.

Mr. Whitney set out to solve the problem and his efforts were crowned with undreamed of success. He rigged up a board with teeth of wire and by pulling the cotton fibre through the teeth the clean staple was extracted from one end while the seeds remained behind. This idea he then de-veloped by fitting the toothed surface to a cylinder which revolved and by coming in contact with a rotating brush, the clean f.bres were picked up off the teetn. By constructing huge ginning outfits on the basic principles outlined in this chapter the cotton-ginning capacity of the country became unlimited. This decisively lowered the cost of producing clean cotton, made possible the wide-spread use of cotton fabrics which in turn stimulated the growing of the staple until the country's recent average has been a yearly yield of something like 12,000,000 bales, with the record crop, that of 1914-15, no less than 16,-135,000 bales of 500 pounds each.

In the early stages of cotton growing the portable gin was a usual figure, moving from plantation to plantation and doing its work at a fixed charge. In the period 1790-1810 cotton was usually shipped in sacks weighing from 200 to 300 pounds, with a compression of about five pounds per cubic foot. Soon the shipping companies began to demand a better compressed package so that a more efficient use of space could be effected. The next important improvement was the wooden screw press, wherein the cotton was put into a box-like container and mules were hitched to a lever perpendicularly attached to a large screw, the revolving of which pressed down the cotton into the box. This form of press made a square bale with a density of eight pounds per cubic foot. The hydraulic press increased the pressure to twelve pounds per cubic foot and modern steam and electric presses attain a pressure of from fifty to sixty pounds per cubic foot which, after the bale has been released, results in a final compression of about twenty-two and a half pounds per cubic foot. Considerable use has been made of the round-type baling press wherein the cotton is wound around a cylindrical core, resulting in a neat bale carrying a minimum of tare. Under gin pressure, three cars can be loaded with about 100 bales. With compress density, one car can be loaded with about seventy-five bales. This density is about thirty pounds to the cubic foot.

Some bales from the Delta, but comparativey few, weigh in the neighborhood of 700 pounds. Taking the cotton belt as a whole, the bales weigh generally on an average of 500 pounds.

The matter of warehouses and ample facilities for handling the nation's cotton crop is one of vital importance to the success of the industry. Warehouses are necessary in the ginning and baling centers, at shipping terminals and export points, and also in those cities where cotton manufacture is conducted on a large scale. Every large cotton mill has among its plants a warehouse for storing enough raw material to supply its needs for several months. Not a few large storage buildings are owned and controlled by exporters, commission houses and factors who primarily specialize in financing and affiliate the warehousing of cotton with the loaning of money against warehouse documents.

The chief essentials of a good warehouse are convenience of access, protection of the contents from the weather, and safeguarding against damage by fire. They range in style from a frame building covered with corrugated iron sheeting to the modern brick or concrete structure. In addition to being equipped with an adequate sprinkler system, the warehouse is divided into separate sections. Should a fire occur in any one compartment the doors are immediately closed tight and by thus shutting off the air supply, combustion is retarded.

One of the greatest and most complicated of tasks to be tackled by the American business man is the financing and handling of the cotton crop, from the time it leaves the growers' possession, to the time when it is delivered to the cotton manufacturer. Most of the small growers have not sufficient capital to finance their crops and the usual custom is for them to borrow from the country merchant in their locality. Even while the cotton is still in the field they borrow in the form of charges for advances of groceries, merchandise, and farm implements and repay these loans by delivering to the country merchant the cotton when it is ready for market. Tenant farming is also in vogue where the workers of the soil rent the land and receive advances, later repaying with cotton. Very common throughout the South is the formation of cotton-growing syndicates operating over great tracts, aiming to raise enough cotton to sell directly to the manufacturer. These are financed by local banks.

When the cotton is ready for market, it usually finds its way to the mill through

the hands of three intermediaries. First there is the local or "Street buyer" who often journeys through the back country, buys up small lots from the farmers, and accumulates them at one central station. The "Street buyers" operate in the small towns making trades for wagon-loads as the farmers bring them in. Then at various central points there are local firms and sometimes small branch houses of large distant firms who purchase the cotton from the small buyers. These firms in turn have close connections either with the large export houses or the large cotton firms who purchase for the account of spinning mills. Great sales of cotton are made at the stations where it is collected to be compressed into bales, as well as at the ginning places. As the cotton which has been purchased is being baled up, the purchaser has experts on the spot to examine carefully the quality of the staple and insure the delivery of proper grades. This careful supervision is necessary. Hundreds of bales are constantly being shipped to the mills. As the mills require certain grades of cotton for which no other grades can be substituted, any discrepancy in quality creates serious inconvenience.

The large cotton firms which play the most important part in the accumulation and directing of the cotton crop, must have great financial resources. They usually buy both for domestic spinners and for the export trade and frequently they finance not only the growers but also manufacturers and cotton in transit. Great banking institutions have arisen which have made a special study of the needs of the cotton trade. They aim to have on hand ample credit when the trade needs it. These banks have promoted the construction of huge modern warehouses at the various ports of entry throughout the country and also in important cotton centers of the South in addition to providing warehousing facilities for both raw and finished material in the cotton manufacturing centers.

The most important cotton trading markets are New Orleans, New York, and Liverpool. The New Orleans cotton market is what is known as a spot market, that is, its trading involves or implies the actual transfer of cotton from seller to buyer. The New York market, however, deals largely with transactions in cotton that are termed futures.

Futures are contracts to sell or deliver and to buy or to receive cotton, at some future date, two, four or six months ahead. Each contract is binding and its physical completion is the tendering and receiving of 100 bales, approximately 50,000 pounds. A very few only of these contracts are completed this way, however. Those who use them, merchants, planters, exporters, manufacturers, investors or speculators, trade in contracts of sufficient future maturity to allow them the use of



Proposed New Cotton Exchange Building, New York City

the contract for their particular purpose, closing them out in the open market without the necessity of physical completion. They sell them or buy in those preziously sold, settling the difference in value with the opposed side of the contracts, through their broker. A great many of them are used for hedging purposes. Hedging may be defined as insurance, or protection against fluctuations in the price of actual cotton. The southern cotton factors and exporters use future contracts as hedges very extensively. They accumulate various

quantities of cotton, sell futures as a hedge against the 'spots,' figuring out the cost first-hand, the handling, insurance, storage until a market is found, the freight to the market, manufacturers at home or abroad,



New Orleans Cotton Exchange Building

and adding their commission, offer their holdings at a price based on the price of the future delivery contracts they have sold as hedges. This is known as "selling cotton on basis," that is, the price is based on the price of futures. The buying of cotton in this manner is termed "buying on call." The buying in of the hedges fixes the price to be paid for the shipment of cotton. Thus, the cotton shipper, pending the marketing of his cotton, has protection against advances or declines in the cotton market. Those who "call" can do so at their convenience, either when they have arranged their finances to receive the cotton or at the time they think most advantageous to them. Should they believe cotton prices will tend lower at a later date, they defer fixing prices. The future contracts being used, standing open, may approach maturity, in which case they are covered, i.e., bought in, and contracts of a more future maturity put out or sold.

The whole sistem of cotton trading, futures, and hedging, is founded on the facts that the yield of the cotton crop is constantly a fluctuating quantity and that the quality is always uncertain. Through factors which decisively influence supply, such as the weather and pests, together with the usual uncertainty of factors which determine demand, not only in this country, but also abroad, estimates as to the

future demand and supply of cotton are always undergoing changes in the opinion of merchants. No one knows what cotton will actually be worth a month hence; but there is a vast number of traders who are willing to invest or speculate as to the probable future price of cotton after they have made painstaking studies of supply, demand, and general industrial, political, and international conditions. In addition to these expert analysts of the market, there are thousands of "outsiders" usually called 'the public," who are willing to speculate on the probable course of future prices. The future price is the essential one, in view of the fact that merchants and manufacturers most always have future delivery in order to anticipate their requirements, as no manufacturer would think of trying to fill his needs on a few days notice while most of the cotton crop is concentrated in seaport warehouses and southern terminals. Thus, in the large future markets there are many minds meeting as to the value of cotton, on the spot and in the future, and these many ideas and operations make a large market, international in its scope, so that prices made by transactions are fully representative of the value of cotton. The larger a market the better the market.

This willingness to speculate on the future course of prices is the foundation of the practice known as "short selling." To sell a commodity "short" is to contract to deliver a certain quantity of it at a future date at a specified price. The short seller on the exchange does not own any actual cotton, but is prompted by the motive to buy at a cheaper price before the time of delivery. The grower will often sell his crop in the early part of the season because he believes he can get a better price for it then than will prevail when his cotton will be actually ready for market. Thus, many of the local cotton buyers who believe that sometime during the future months conditions may arise which will adversely affect the market, act on this belief and sell short any given number of bales. They hope that they will be able to buy this cotton in more cheaply from the grower at some subsequent future date before the time of delivery.

On the other hand, there is always a group of buyers who have figured out that cotton offered at a specified price for delivery in some future month would make a good purchase in view of the fact that they believe there are ample grounds for a rise in the market. These operators are willing to buy cotton for a specified price

for future delivery, in the hope that when the cotton is subsequently delivered at the previously stipulated price, the general market will then be higher, so that they will be able to dispose of their purchase at that time at a profit. Part of this activity is investment and part pure speculation. The market is always fluctuating in accordance with the reports that come in from the weather bureau and the agricultural districts; with advices that bring news of threatening disturbances that might shut down the mills and thus weaken the demand for cotton, and with reports from abroad of varying conditions. In contrast to these pessimistic reports, news of an opposite nature constantly comes to hand which tends to create the impression that either the cotton crop will be small or that the demand from the mills will be large. This constant interplay of bullish and bearish features, creating impressions and fathering actions on the part of the many operators in the cotton market, contribute to the formation of a highly organized and sensitive trading condition wherein the prices at which cotton transactions are made are instantaneously flashed by wire to all the business centers of the world.

It must be constantly borne in mind that in the New York Cotton Exchange these daily transactions of hundreds of thousands of bales involve not the cotton itself, but merely the right to buy or sell a given quantity at a certain date. It is through the agency of the New York exchange that the speculative groups of the community are enabled to exercise their function, namely to absorb the price fluctuations of the commodity and to enable the actual purchasers to insure themselves against loss.

A mill which employs many thousands of hands which is consuming great quanti-ties of cotton, may contract for its needs for several months hence. Let us suppose that a merchant wants to sell this mill some cotton at a certain price. The merchant does not know whether he will be able to obtain cotton all along at the present market levels, and engaging himsef to do so would necessitate taking great chances on the probable course of the market. If the market should go down, he might be able to profit greatly by selling the mill contracted cotton which he later buys on a declining market for a lesser price, but the market is liable to go the other way and after having contracted to deliver cotton to the mill, should the market rise, then he would be forced to buy in and deliver at a loss. To protect himself, the merchant

can hedge. For example, at the same time that he contracts to deliver one thousand bales of actual cotton to a mill three months hence, he enters the futures market and buys one thousand bales for delivery three months hence. Let us suppose the time for the delivery of the cotton has arrived. If the market has risen and he is forced to buy his cotton to fulfill the contract at a loss, this loss is naturally offset by his ability to sell his futures contracted at a price just so much higher than his previous futures purchase. On the other hand if the cotton market has declined and he finds that he can buy his cotton much



MOSES BROWN

more cheaply in the market than the price for which he contracted to deliver to the mill, his profit from this circumstance is offset by the decline in the value of his futures purchase. The result is that through operating in futures the cotton merchant negates any profit or loss due to fluctuation in the market that might occur between the time when he made his contract to sell the cotton and the time when the cotton is to be delivered.

The cotton manufacturer also takes advantage of hedging to insure himself against loss. He can thus secure protection not only against rise in price of the raw material, but he can also protect himself against any losses through a decline in the

market value of cotton products on hand or in process of manufacture. suppose that a cotton spinner has accepted orders based on the current market price of cotton in a quantity which exceeds the amount of cotton he actually has on hand. Let us suppose it will require several months for him to complete his orders. During this time, he is at the mercy of fluctuations in the cotton market, profiting or losing as the market rises or declines at the time when he enters to replenish his needs. If he buys futures to correspond with the quantity he actually needs, however, he can profit on his futures provided the market rises to an extent equivalent to losses incurred by having to buy higher priced cotton to be used in the manufacture of yarn which was previously contracted for at a lower price. On the other hand, if while he is working on his order, the spot mar'et declines, the advantage that he derives from purchasing low price cotton is offset by the fact that he must dispose of his futures at a loss. In this way, he assures himself of neither gain nor loss to be affected by any fluctuations of the market, and being a manufacturer, he is left free to concentrate his energies on production and earning his profit from manufacturing operations.

Now, let us suppose that a spinner or a cotton cloth manufacturer has plenty of cotton on hand but no orders. Ordinarily it would be folly for him to keep on manufacturing goods to be put into stock, because the cotton market is liable to decline and lessen the value of the product. He can protect himself, however, in such a contingency by selling futures, that is, by contracting to deliver cotton at a given date in the future, (presumably equivalent in value to the merchandise he is making up for stock) and if by that future date the cotton market has seriously declined, he can offset the losses incurred on his product by purchasing or covering his future contracts at a price lower than that price prevailing when the future contracts were originally sold. Thus month by month a manufacturer can protect himself against losses that might be due solely to fluctuations in the raw material market.

In this way the exchanges perform their functions as an outlet for the speculative energy of the more daring groups of the community who are willing to make their profits solely by absorbing the shocks of price fluctuations and by insuring industrial operators against losses that might be incurred from price changes. The following

is a copy of a cotton contract covering future transactions on the New York Exchange.

CONTRACT

"New York.....l....

"In consideration of one dollar in hand paid, receipt of which is hereby acknowledged, have this day Sold to (or Bought from)

50,000 lbs. in about 100 square bales of Cotton, growth of the United States, deliverable from licensed warehouse, in the Port of New York, between the first and last days of next inclusive. excepting as provided in Section 106 of the By-Laws of the New York Cotton Exchange. The delivery within such time to be at seller's option in one warehouse, upon notice to buyer, as provided by the By-Laws and Rules of the New York Cotton Exchange. The Cotton dealt with herein or delivered hereunder shall be of, or within, the grades for which standards are established by the Secretary of Agriculture. except cotton prohibited from being delivered on a contract as provided for by the United States Cotton Futures Act, fifth sub-division of Section 5, and shall be of no other grade or grades (subject to the United States Cotton Futures Act, Section 5, and subject to New York Cotton Exchange inspection and classification) at the price of cents per pound for Middling, with additions or deductions for other grades, in accordance with the provisions of the United States Cotton Futures Act. Section 6.

Either party to have the right to call for a margin, as the variations of the market for the like deliveries may warrant, and which margin shall be kept good. This contract is made in view of, and in all respects subject to the United States Cotton Futures Act, Section 5, and to the By-Laws and Rules, not in conflict therewith, established by the New York Cotton Exchange."

WOOL

Sheep-raising is essentially a frontier industry. It flourishes most in sparsely settled areas where the land is not subject to intense cultivation. In the United States sheep-raising is conducted as a basic industry in the Western States, such as Montana, Nevada and Texas. But in the Mid-Western and Eastern States, sheep are raised as a "side-line," in small flocks grazing on the unworkable acres of the farms.

The United States does not by any means grow enough wool to satisfy its own needs. On the other continents, however, there are clipped large surpluses of wool every year to be shipped to the manufacturing centers in America and Europe. We quote here some figures to present an idea of the distribution of wool growing throughout the world. The following gives the figures of wool production for the year 1919 by continents and countries.

WOOL	PRODUCTION	OF THE	WORLD
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No. America			335.739.000	nounds
Sou. America				
Europe				
Asia				
Africa				
Oceania			.825,100,000	••
Total world	d	2	.893,073,048	

and Europe—which include practically the whole civilized area of the world.

There are various classes of wool raised throughout the world, each class depending on the breed of the sheep and topographic and climatic conditions in which the wool was grown. Pure merino wool is very fine in fibre and even in texture, lending itself most suitably to the processes required for the production of fine fabrics. Merino sheep are raised primarily for their valuable wools. Physically they are scraggly animals with little desirable meat upon them. They were raised by the Saracen population of Spain. The merino sheep is native to a mountainous section and foraged for food in hilly ravines and glens



Lewiston, Me., 1856, Showing in Background a Bagging Mill, Bates and Hill Mills

A consideration of the wool resources of the American textile manufacturing industry, therefore, would by no means be complete unless it included a survey of foreign wool production. A considerable portion of the wool consumed in the United States is imported. For instance, in the decade preceding the late war in Europe the United States was consuming approximately 500,000,000 pounds of wool annually. During these years imports ranged from 12 to 34 per cent of all fine wools used for the manufacture of cloth for apparel, and appreciable percentages were also imported for carpet and blanket manufacturing. The American supply of wool is not, therefore, limited to the borders of our own country but we are to a large extent dependent upon foreign

The great wool producing sections of the globe are Australia, New Zealand, South Africa, South and North America, Asia,

covered with underbrush. Such fodder would not therefore produce a well-fattened sheep padded with mutton. But whatever meat-giving qualities were lacked by the merino sheep were offset by the superb fleece.

The greater the proportion of merino blocd in a given breed, the finer and more valuable is the wool. Thus half-blood, three-eighths, and quarter-blood wools range in a descending scale of values. Quarter-blcod wools are very coarse in fibre and are not suitable at all for the production of fine dress fabrics. In England, a different system of classification is used to designate the superior qualities of the wool. The fineness of the wool is specified by the "number of hanks of 560 yards each to a pound of yarn"—the finer the wool, the greater will be the count, of course. Thus classifications of Australian and New Zealand wools are designated somewhat as follows: 80s, 70s, 64s, 60s, 58s, 56s,

54s, 50s, 48s, 46s, 44s, 40s, 36s, and 32s. A full blooded merino count will average 66-80s. A half-blood wool will average 54-60s. A three-eights blood wool will average 48-54s. A quarter-blood wool will average 44-48s.

Australia and New Zealand comprise the world's largest wool-growing section. These countries support more than 112,-000,000 sheep with an annual wool clip totalling 825,000,000 pounds. Geographically, the country is well suited for sheep raising. However, there is one adverse feature that occasionally hits the country badly and causes great damage not only to the sheep industry but also to the agrirultural areas. This is the periodic drought that so fatally harries the land. Only in recent years continuous dispatches from Australia brought news of the distressed condition of the land because of the months long absence of refreshing rains. Sheep pasturage withered down to the bare earth; prepared fodders were expensive and scarce; flocks shrunk fast in weight and the wools grown during the drought lost lustre, suppleness and strength. Very usual was the sight of sheep left to die in the sun-burned fields because packing plants were too far distant to permit transporting the sheep at once to be slaughtered for their mutton.

Even in our own country, the wool grower has felt the devastating hand of continuous heat and drought. During 1919 thousands of sheep were shipped from Arizona and Colorado into Texas and the wool clip figures of that state have increased sensationally. Texas fields, that year, were much greener and moister than those of the neighboring states to the north and entire flocks were shipped southward to escape the fatal forces of heat and drought.

It is interesting to note that in many sheep-raising sections the cross-bred or "mutton sheep" tend to be reared near the coast. This is because the large meat packing plants in Australia, New Zealand and South America are located near the sea-ports for conveniences of oversea transportation. New Zealand and South America are known principally as producers of cross-bred wools.

The domestic wool supply of the United States is an eloquent example of the oft declared fact that in many things we Americans are still frontiers-men and pioneers. Comparing our wool growing methods with those of the scientific flockmasters of Australia and the thrifty peasants of Eu-

rope, our sheep men are but novices. We are gradually learning to take studious pains in sheep husbandry and wool culture. In Australia the sheep-men as a class are very wealthy people, very often men from the English universities, who control vast landed estates and raise sheep from a genuinely business point of view. Highly advanced methods of preparing wool for the market in vogue in Australia, many features of which are being adopted by the most progressive element among American sheep-men will be discussed later.

Scientific sheep farming in America is at present in its initial stage of progress. In the farming areas they are kept as a side-issue, foraging on some hilly or woody tract, sold when prices of wool are low, and bought up again when the wool market rises. Careless keeping often results in an animal afflicted with parasites and a fleece full of stains and burrs.

East of the Mississippi River sheep are usually raised as a by-product, valuable as much for the meat as for their wools. The cost of keeping them merges in jointly with the total expenses of the farm and the flocks are not large enough for the introduction of the scientific and business-like methods of large scale operations. West of the Mississippi in states like Montana, Nevada, Utah, Wyoming, and Texas, sheep are kept in large flocks and their handling has assumed the proportions of a separate business.

Great strides are being made in our Western States to develop the sheep industry along the modern lines prevailing in Australia. Expert sheep breeders and wool handlers have been brought over from Australia to supervise the introduction of efficiency methods in the West. The foundation of the system is the establishment of large shearing plants, centrally located within the sheep-raising territories, where the sheep are brought to be clipped in season by contract. Some of these plants are capable of shearing from 50,000 to 100,000 head of sheep in a space of three weeks.

In getting the sheep to the shearing pens they are driven in easy stages so as to keep them in the best physical condition and to avoid getting any dust into the fleeces. The object of keeping the sheep in prime health during the shearing period is to eliminate as much as possible the chances of their catching cold after losing their fleece. Very often, if the weather is cold the sheep are kept in the shearing plants under cover until the day after their wool is

clipped. In some plants the main floor is raised, so that there is space in the basement for keeping the sheep under cover after shearing. The owners of the flocks make contracts with the shearing companies and they are given an appointed date for their turn to bring in their sheep.

Before the sheep are ready for shearing they are kept for a few hours in the sweating pens where the temperature is about ten degrees higher than that on the shearing floor. The reason for this is that the wool shears much easier if the sheep is in a sweated condition. Otherwise the fleece may be dry and hardened, causing much trouble to the shearers.

In the shearing plants the operation is conducted on large floors, well-lighted and various colored baskets to receive the wool. The baskets painted black are for black wool. Locks are thrown into baskets with black stripes, and green stripe baskets receive the wool known as the bellies. Sweeper boys are stationed with brooms in various parts of the plant to sweep up all pieces of wool to the proper pile, and while the fleece-throwing boys are prepared for handling the fleeces. A long blow of a whistle followed by two short blows is the signal for beginning work. The shearer disappears into the catching pen and emerges a moment later with a sheep and commences shearing at once. He starts with the wool on the belly of the animal which comes off in one piece, falls on the floor and is immediately picked up by one



Manchester, N. H., in 1855. Amoskeag, Stark Mills and Manchester Print Works are Among the Buildings on the Bank of the River

well-ventilated. The floors are constructed of hard wood and they are scrubbed and polished twice a week. When the shearing operations are in full swing in the plant, it is a veritable bee-hive of industry.

The shearers are usually Australians and Americans who travel from state to state following the various shearing seasons. Their work is very difficult and requires great hardihood. They are spurred on by a spirit of keen rivalry and it is reported that one Australian shearer who is an expert at his trade has often clipped 233 sheep in a day, taking about one minute and forty seconds to a sheep.

In the morning all workers are gathered together in the shed prepared to commence operations. The superintendent glances over the various sections of the plant and sees that all the workers are in their proper place. At the sorting tables there are

of the sweeper boys to be thrown into the basket designated for bellies. The shearer then shears the fleece off in one piece and by the time the operation is complete, the sheep has been getting closer to the exit chute and with the last motion of the shearing operation the sheep is pushed down the chute. Meanwhile the fleece-throwing boy has picked up the fleece and placed it on the nearest skirting table, and by the time the shearer has emerged from the catching pen with another sheep, one of the sweeper boys has swept up the floor and taken away the stray locks.

These movements go on mechanically and continuously as sheep after sheep is thrown out of the pen subsequently to be pushed down the chute completely shorn. After the fleece thrower has thrown the fleece on the table, the skirter commences his operation. There are two skirters, one on

each side of the table. There are revolving slats in the table which shake out all the loose dust and foreign material. falls to the floor. The process of skirting removes the stained, burry and damaged wools by trimming them off around the edges of the fleece. The faulty wool that is skirted from the forward part of the sheep is thrown into a basket and called "first pieces." The faulty wools that are skirted from the hind quarters of the sheep are gathered separately and called "second pieces." After the fleece has thus been skirted, it is folded and rolled up and placed on the wool classer's table. wool classer then makes close examination of the fleece by squeezing it to determine its resiliency, pulls some of the fibres to determine the length, and also judges whether the wool is of combing length or carding length, and whether its condition is bright and sound or dull and tender. After the proper quality and grade of the wool has been determined, it is placed in a proper bin ready for baling. All these operations proceed with remarkable speed. It takes about two minutes to shear a sheep and about five seconds for the fleece to be picked up and thrown on the table. Skirting and rolling requires about another thirty seconds and not more than eight to ten seconds is taken by the wool classer to determine the grade of the fleece.

At present most of the American wool clip is not handled by the Australian system, involving as it does the erection of shearing plants in the West and the grading of the wool at the plant. The wools are either sold or consigned to an eastern dealer who receives at his ware-house numerous small clips (unsorted) and his grading staff sorts out the wools in order to have ready for the manufacturer a large weight of any one particular grade. The obstacle to the rapid growth of the Australian system is that the manufacturers are reluctant about going West to make their purchases when dealers' salesmen are every day knocking at their doors with samples.

The various channels of business through which the wool moves in its progress from grower to manufacturer are as follows: In general, there are three ways in which wool is disposed of by the grower: (1) public auction; (2) the consignment house; (3) the wool merchant.

The auction system was first developed in England. It had its origin in the peculiar fact that in the early days of Australian wool production the wool was so inferior to the European kind that colonial wools were

to be put up on the auction block for whatever they would bring. This system, however, easily became a permanent institution and its methods and practices became so highly developed that great benefits were derived from it by the growers. At the London sales great quantities of Australian, New Zealand, and Cape wools are sold annually. To a great degree, these auctions made London a re-distributing center for foreign wools, so that buyers from the Continent and the United States are in constant attendance to supply their needs.

The position of London as one of the world's great wool markets was at the outset enhanced by the financial strength of its promoters who were free in advancing capital to market the colonial clips. In order to render it easy to obtain loans against their wool while it was in warehouse or transit, the colonial growers took great pains to standardize their flocks and to grade and pack their wools uniformly and carefully. Rigid classifications for the various sorts of wool were established, to which the growers faithfully adhered, and soon the London sales became one of the world's foremost enterprises.

In the United States an attempt in 1674 by private initiative to introduce the auction system of wool sales proved a failure. Beginning 1919 and continuing into 1922, however, the government, having been left with large surpluses of wool after the war, conducted a series of auctions. Both dealers and manufacturers bought freely and for a while this disturbed the regular balance of the industry.

Boston is the heart of the wool buying business in the United States. This is due to the fact that wool manufacturing first sprang up on a large scale in New England, later spreading southward through New lersey and Pennsylvania. Once an industry becomes established in a certain district, as the wool business in Boston, it tends to grow and increase of itself. The wool firms develop expert staffs of buyers and salesmen. The bankers after many years of financing wool transactions acquire a peculiar skill along these lines. In addition, Boston as a seaport can receive direct shipments of foreign wools and thus its dealers can display a complete line of stock for the examination of manufacturers. The next largest wool handling centers are Philadelphia and Chicago. Philadelphia dealers supply the large knitting and spinning operators in their district. Chicago has come to the fore as a wool center because of its great packing industry. After the sheep in the stock yards are slaughtered the wool is pulled from the skin. Such wools are known as "pulled wools." Some of the large packing concerns slaughter so many sheep annually and accumulate such great weights of pulled wool that they maintain their own wool selling organizations or are at least allied with dealers who handle their lines of wool regularly.

Dealing in wool is a highly developed business requiring not only an expert technical knowledge of fibres and shrinkages, but the successful wool operator also requires the command of vast sums of capital, shrewd judgment, and resolute courage. The overhead expenses of the wool dealer are a very significant item in his costs. He must maintain a large warehouse centrally

These firms or individuals who buy up the wool in the wool growing sections to sell over again to the large eastern dealers, usually conduct their business in conjunction with another line, such as store-keeping. Wool buying here is a sort of side-line with them, and they are termed 'country buyers." Some eastern dealers have several hundred country buyers from whom they buy wool. This system prevails largely in the states east of the Mississippi where flocks are small in number and each farmer clips only a few hundred pounds of wool. The country buyer visits the farmer at the clipping season and after extended dickering buys his wool, ships it together with many similar lots to one point, and after he has accumulated a carload lot he sells it to an eastern firm.



Amoskeag Counting Room

located to serve the convenience of buyers. A large office staff is required to record adequately the many transactions and steps involved in the buying, shipping, storing and grading of several million pounds of wool per year. If the dealer wishes to carry a complete line of domestic wools, he must have buyers in the New England section, the "fleece" wool states of the Middle West, in the "Territory" states west of the Mississippi, and in California. There are few houses, however, that cover the field so completely. Many of

There are few houses, however, that cover the field so completely. Many of the eastern dealers concentrate their energies on the selling end of the business. Through the activities of a well-trained salesforce they endeavor to keep open a steady outlet for wool and this wool they purchase from small inland firms which are located in the heart of the wool grow-

West of the Mississippi River, however, where wool clips run into the thousands of pounds on each range, the grower offers his wool directly to the eastern dealer. The dealers usually send out buyers to the Territory states early in the spring. Shearing usually begins first in Arizona early in the spring and as the weather grows milder shearing operations spread northward. Thus the buyers travel from state to state according to the periods of shearing and bid on the various clips when they are ready for shipment.

Very often, if dealers believe that there will be a very good demand for wool during the ensuing manufacturing season they will "take a chance" and purchase the clip while it yet unshorn and on the sheep's back. This form of business is called contracting. Usually when such a contract is

executed the dealer makes an advance to the grower of from fifty to seventy-five per cent of the value of the wool calculated from the price at the time at which it was bought. This system of advances to growers has been of great financial help in the past to the Westerners.

The large dealer's problem is not then merely one of buying and selling. must arrange for the financing of his business. Whether he buys his wools from abroad or from the West there is usually a period of from two to three months between the time when the wool is bought and shipped out and the time when the same wool is forwarded and billed to the manufacturer. In recent times when the railroad facilities of the country were in far from first-class condition, due to excessive strain during the war and also to the congestion of freight on account of extraordinarily severe winters, many shipments of wool, as well as other commodities, were stranded en route. The wool while in transit was unmarketable, vet interest charges thereon were accumulating.

After the wool arrives at Boston or Philadelphia it is stored and then sorted according to staple and condition. This part of the handling may require from one week to a month and even longer, according to the quantity of wool in the shipment and the size of the grading plant of the dealer. There are some firms whose business exclusively is to sort, pack, and store

wool on a commission basis.

The consignment house is a form of wool dealing that has become quite popular of recent years. The dealer acts merely as an agent for the western shipper. When consigned wool arrives at Boston or Philadelphia, it is stored and graded by the receiving firm acting as agent, and the expense is charged up to the shipper as principal. Then the eastern dealer offers the wool for sale and wires back to the consignor for instructions to accept or reject the prices that are bid. The dealer thus acts as a broker for a fixed commission. This plan has been especially resorted to during years of a very unsettled wool market. At such times dealers are not inclined to hazard outright purchasing of wool when the mills are not in the market. The western holders of wool realize that the wool eventually be consumed in the eastern manufactories, so that they have nothing to lose by consigning the wool to be stored in the East until sold.

During recent years a movement has developed among growers to pool their

wool, that is, to store their clips at a central warehouse and there offer it for sale in large lots. The fundamental aim of this plan is to eliminate as much as possible the necessity of dealing with middlemen and to sell the wool as directly to the manufacturer as is possible. operative movement among growers has brought many advantages to its members, but the attainment of many of its goals is distinctly open to question. On matters of a technical nature, such as the improvein the handling and sorting of wool, and in the development of a common and fraternal spirit the co-operative societies have met with their expected success. Again, to the grower of wool in small lots who is at the mercy of the itinerant peddler or shrewd store-keeper for the disposal of his wool, the co-operative wool selling organization has been a positive help.

But there are some problems which cooperative selling has created but not yet solved. For instance, the pooling of wool is certain to result in the mixing together of wools of the same grade, but of different shrinkages. The distribution of cooperatively obtained revenue may not be as equitable to the grower as when he was free to bargain for his own price on his clip alone. This can be obviated only by a strict checking up of the qualities of the wool of each member. Thus far, the cooperative organizations have usually disposed of their wool either to or though some eastern dealers. Wool is not a commodity hemogeneous in quality such as iron, copper, or even cotton. The almost number-less variations in the qualities and adaptability of wool require a highly trained grading and sales staff to prepare and market the goods according to the needs of the manufacturers. Appreciating that this is so, the wool pools are thus far usually content to offer their wools (by sealed bids) to the highest bidder, irrespectively whether the purchaser is a manufacturer or a dealer. In the meanwhile the wool growing and wool selling business is in a semitransitory state. These various movements and methods of handling wool are all competing sharply with each other and there is no doubt that the future holds in store the development of a system that will retain the best features of both the old and new ones. As long as the dealer will perform efficiently a necessary service that cannot be conveniently obtained without him, just so long will he be getting his just share of the country's wool business.

FELT

THE ORIGIN, CONSTRUCTION, USES, TYPES, STYLES OF FELT, AND THE DEVELOPMENT OF THE FELT MANUFACTURING INDUSTRY

By Sylvan I. Stroock.

Felt is used in many ways, but a large proportion of its users do not know the source of this product, nor oftentimes just where and how it is employed. To the first man and woman is accredited the origin of felt. They probably found that the hard, cold ground was indeed hard and cold, and presumably for "self preservation" and for an easier "couch" collected quantities of grass and foliage, piling and pressing them together, causing them to "mat."

The encyclopaedias and dictionaries, both old and new, define felt somewhat as fol-

lows:

"Felt is a fabric which results from the matting and intimate adhesion of fibrous materials amongst themselves, and is not like ordinary cloth, produced by any spinning or weaving processes."

"A fabric made by interlocking or compacting wool, fur or hair, or a mixture thereof, by rolling or pressure without weaving, often with the aid of

glue or heat.'

From the simple origin of felt, many diversifications have sprung. When the twentieth century rolled around some of the products of the woolen, cotton, paper, and even asbestos industries were included under the general term of felt. The result was, in a certain sense, confusing, as the term was frequently used in a vague way. Products which are frequently called by the general term "felt," without any further designation, include the following:

Textile felt, the best known and most used kind of felt and therefore chiefly considered in this article, sheet felt, paper makers' felt, woven felt and mechanical cloths, lithographic felt, hatters' felt, products of the felt specialty and cutting industry, hair felt, cotton felt, ship felt, building felt, roofing felt, asbestos felt, and as-

phalt felt.

From almost every one of these industries have come other products more or less re-

lated to "felt," but the limitation of the pages of this volume prevent a discussion of the history and composition of them all.

This article will be confined almost exclusively to a brief history of the kinds of felt which are members of the "textile family" and of most interest to the textile trade.

In prehistoric times felt was not only for bedding purposes and for clothing the human body, and also in connection with the building of huts, etc., to keep out the cold and the wet. It is fair to assume, and easy to understand that felt was probably known prior to any woven fabrics, considering the extreme simplicity of material, and the readiness with which wool coheres, or "felts."

Encyclopaedias state that felt has been made and used from the most remote antiquity, and that from time immemorial, it has been employed for clothing and tent coverings by the tribes of Central Asia. It was, and still is, in use amongst the Circassian, Armenian, and the Tartan tribes. Felt is mentioned by Xenophon and Pliny, and Marco Polo describes its manufacture, appli-

cation, and uses by Asiatic races.

During the twelfth century we find that felt was used in France. There is an old legend which tells of a monk named St. Feutre, who, in making his pilgrimage to the Shrine of St. Michael, started off wearing a brand new pair of sandals. He walked and walked until he became weary, tired and footsore, and suffered great agony. Then the idea occurred to him to pluck from the backs of passing flocks of sheep, handfuls of wool, which he placed upon the soles of his sandals. Immediately this gave him great comfort, and enabled him to proceed upon his pilgrimage in perfect ease.

At the end of his journey, he removed his sandals, and lo and behold!—at the bottom of each one was a cloth, firm of texture, soft to the touch, and strong, made from the wool of the sheep. He in his walk, had pressed and trodden the wool

into the cloth called "felt."

Skipping to the early part of the twentieth century, we find that in Russia, felt was made in tremendous quantities, even before the advent of any modern machinery. The hair of the calf, cow, and horse, and wool from the sheep, were clipped and mixed with each other, trodden and pressed together by plain, old-fashioned foot power, and thus stamped into a fabric, termed, and known as "felt. At times the raw stock was saturated with glue or sizing of various kinds to facilitate the adhesion of the stock. In making, when any desired increase in thickness or density of the felt was required, it was attained by the addition of more raw stock, and then, when the desired thickness was seen by the naked eye, and felt by the hand of the stamper, the treading ceased, and the fabric was considered finished and complete.

Russia became a large producer and exporter of felt, styled "Russian Hair Felt," She maintained a large export business thereon until about the year 1875, when America came to the front with better felt of her own home production, and thereupon, and thereafter, ceased the importation

of felt.

In our shoes the box toes are made of felt, the heel pad is made of felt, the inner sole is probably made of felt, the tongue is probably lined with felt, and there is more than a likelihood that there is a large cushion of felt between the outer and inner sole. On the inside of our coats and overcoats are large pieces of felt. It is that felt which enables the maker of the garment to build you a coat which keeps in shape. That important and particular item inside the coat is called a "front."

Of course, you know that your hat is made of felt. Have you noticed that upon the seat of your office chair you probably have a felt chair pad? The bottom of the telephone at your desk is made of felt. The incandescent electric light bulbs over your head all contain felt. It is an absolute requirement in the manufacture of electric lights and other electrical supplies and The base of your ink well stand and your cigar stand is probably made of felt. Your adding machine, billing machine, typewriter and cash register, all contain felt, and your ink pad and stamp pad all contain felt as the basic component part. The drawers of your desk are lined with felt, and the glass in your windows is set in felt There is, no doubt, a weatherstrip, also made of felt, attached to the window frame to keep the drafts out.

In your home it is a similar story. The ironing board in your kitchen is padded with

felt; lamp wicks are made of felt. The laundry machinery that launders your linens requires felt. The paper that you use, whether newspapers you read, or the stationery you write upon, could not be made without felt, as the machinery upon which paper is made requires felt for the carrying rollers. Your chest protectors, your corn and bunion plasters are made of Your house slippers are of felt, the cover under your dining room table is of felt, your card table is covered with felt.

Your son's and daughter's rooms are decorated with flags, banners and pennants of felt, and on the couch are pillows of felt. The manufacture of school slates and blackboard erasers consumes lar~e quantities of The scarf on your piano is, no doubt, made of felt. Do you know that there are two and one-half pounds or more of felt in your piano and that you could not have music without the felt? The turn-table of your talking machine is covered with felt, and so on throughout all branches of your existence, you will find textile felt everywhere in use, yet seldom in evidence, close in proximity, yet unobtrusive and unnoticed.

In cold countries, entire boots made of felt are worn, called lumbermen's boots, and whole shoes with both sole and upper made of felt are worn. Such shoes are semetimes styled "workingmen's shoes" They are warm, comfortable and inexpensive, and wear very well. Hospital nurses and aged people likewise wear shoes of felt of another type-lighter in weight. Such shoes are worn because of the perfect com-

fort they give.

You probably realize that there is felt in your automobile, but do you know where it is? It is almost everywhere, in the axle, in the wheels, in the crank case, and throughout the transmission are washers, gaskets and oil covers and protectors made of felt. The washer in the axle must be soft enough so as not to groove the steel under constant friction, and it must be pliable enough so that it can easily be inserted and the felt must be of sufficient body so as to retain the oil, and at the same time exclude dust and grit. Felt is also used for washers in steering posts and Universal joints.

Wherever there is machinery of any kind whatsoever, there is felt. Wherever there are mechanical devices of any description, there felt is to be found. It has been said, and it is probably true, that there is no business of any kind or description, however, small or large, that does not, in some manner or other, use some felt, of some

kind or other, for some purpose. This fact was brought to public light during the recent

World War.

Textile felts of endless varieties were great and very important requirements of our military forces. At some periods during the war, the requirements of the United States Government alone, for war-waging purposes, were more than eleven times the full, combined production of all of the felt mills within the country. Felt was so sorely needed that it became necessary for the rovernment to control its manufacture and to eliminate its uses for all civilian purposes, except such requirements as were recognized as absolutely essential to the health and welfare of the civilian population during the emergency.

As an illustration of the importance of felt to the government's war program, below are listed items in which felt was an absolute necessity and important factor. The list is taken at random and is far from be-

ing complete.

In airplane production, gaskets, washers, in packing airplane parts, airplane propellers, in ammunition, shells, explosives, depth bombs, cartridges, Browning guns, gun wads, shipbuilding, torpedo boats, destroyers, mine sweepers, automobiles, motor trucks, canteens, helmets, gas masks, fuse boxes, army overcoats, uniforms, hats, caps. overseas caps, chevrons, insignia, hospital slippers, convalescent shoes, orthonædic uses, splints, Red Cross uses, medical supplies, dental supplies, felt for cavessons, felt for pannier packs, felt for canisters, hoods for oas masks, ammunition box fillers, electric lights, radiator covers, engines, packing, harness, saddles, and smoke filters.

The government also purchased the finished products of which felt was an essential component part. Therefore a steady, running supply of felt necessarily had to be furnished the manufacturers of all of the following in order to enable them to make for the government their finished product:

Mining machinery, gas machinery, tranning machinery, polishing machinery, printing rollers, plating machinery, paper of endless varieties, containers for innumerable products, electrical machinery, flour milling machinery, tool machinery, engraving plates, railway work (gear cases), manufacturers of printing presses, X-ray machinery, pressing machines, lamp wicks, chiropody uses, shoulder braces, arch supporters, compasses, chronometers, gyroscopes, lumbermen's felt boots, glass, lenses, binocylars, and hundreds upon hundreds of other products.

To illustrate the scope of the government's felt requirements, I cite herewith an interesting example:

The Gas Defense Division, of the Chemical Warfare Service developed a new type gas mask, which, through the employment of a certain kind of felt, afforded marvellous protection to our soldiers against gases. This gas mask would have aided materially in winding up the war quickly had the occasion for its use continued. This mask was perfected just prior to the signing of the Armistice and therefore saw no service overseas. For this gas mask alone, during the year 1919, more than 150,000,000 pounds of a certain kind of wool would have been required to produce a sufficient quantity of felt to cover the above program. fairly illustrates how enormous the war requirements of the government were for felt.

An additional illustration of the importance of felt is shown by the fact that during the war, the felt mills had higher priority rating, and were placed higher on the government preference list for fuel than were any mills or factories in any other branches

of textile industry.

There is no other industry, I think, wherein a single manufacturer within the industry diversified a group produces as products and items as within the textile felt industry. All of the manufacturers of textile felts make hundreds upon hundreds of different kinds of felt. make felts varying in weight from onequarter of an ounce, up to many pounds per square foot, and from the minutest part of an inch in thickness up to many inches, and in quality from the cheapest of cotton and shoddy up to the finest of wools that can be obtained, and therefore, varying in price from a few cents up to many dollars per square foot for the finished felt.

A salesman representing a textile felt manufacturing concern can go, with his full line of samples, into any city, and start at No. I Avenue "A", begin at the top floor, work down through each and every office and loft in every business house on both sides of every street within the business section of that city, and he is bound to find users of felt, of some kind or other, in each and

every place he visits

To enter into the intricacies of the manufacture of textile felts would simply lengthen my story, and fail to convey very much more to you, as there are many processes within the course of manufacture that are not easy to understand from the mere reading thereof, so l refrain from comments upon the process of manufacture and the travels of the

raw stock through a felt mill, yet I know I shall have accomplished my purpose successfully if I have shown you how and where you do, in every day life, come in constant contact with, and use some of the products of "textile felt" which only recently has been given that exclusive trade name, in place of the endless variety and number of other names. These which formerly were such names as "pressed felt," "soft felt," "hard felt," "wool felt," "wool and cotton felt," "thick felt," "thin felt," etc., etc., which of course were far from definite in their meaning, are no longer used. It was the kind co-operation of the United States Chamber of Commerce with the industry at large that brought this about, and promulgated the establishment and employment of the word "textile" as a prefix to the word "felt,"—so now, fortunately, "textile felt " can readily be distinguished from other kinds.

The felt mills within this country have not entered greatly into the fields of export business as practically all of the felt that they can at present produce is required for home consumption. Nevertheless, numerous and large inquiries from all parts of the world have, since the war, been circulating around

the felt market of the United States.

SHEET FELT

Sheet felt is closely related to textile felt. It is manufactured in much the same manner as that product. The chief difference in the making of the two is, that in producing sheet felt the carded batts are cut to specific size by hand, and the layers placed on top of each other crosswise, and with great care, so that in the fulling process, the shrinkage will be equal in both length and width.

The finished product is in sheet form. The dimensions and consistency or firmness are determined largely by the amount of stock used, and by the size of the cuts from the batts before the fulling process is begun. The average size of a finished sheet of felt is about thirty-six inches square. Felt made in sheet form can be made thicker and harder than felt made in roll form. This is perhaps, the chief reason why the sheet felt

making industry exists.

Sheet felts are required for many important purposes. A dental laboratory in its equipment requires a product of the sheet felt mills-polishing and buffing wheels. Cash carrier heads are made largely of sheet felts. Piano hammer manufacturers are absolutely dependent upon the product of the sheet felt mills. The hammers are covered with felt and the quality of tone

depends very largely upon the felt used in the making of the hammer. Sheet felt is likewise used in the manufacture of artificial limbs, and on finishing and polishing wheels of innumerable kinds. The finishing of glass is dependent upon this fabric as all

glass is polished with felt.

In 1873 felt produced in this country had already attained recognition throughout the civilized world as being of the finest quality. Piano hammers made in America were, at that time, awarded First Prize at the Vienna Exposition and World's Fair. A few years later, the superiority of felt of American manufacture was again demonstrated when First Prize was again awarded to an American manufacturer at the Paris Exposition.

PAPER MAKERS' FELT

Paper makers' felt is a product of the woolen industry. It will be readily seen that the term "felt" is a misnomer, as both the felts and the jackets made in paper makers' felt mills are made of wool that is carded and spun and woven. The name "felt" was given them because of the felting or fulling process, which is so important in their construction.

In construction, a paper makers' felt is an endless woolen blanket, made of large and strong threads of long fibre wool, woven and felted heavily but sufficiently porous to allow the water to pass through freely. kind of felt is of different qualities suitable for the various grades of paper. In the finer qualities of paper, a fine weave, with a soft nap, is required, so that the thread impressions will not be pressed through on to

the paper.

In the manufacture of pulp, both ground wood and chemical, it is run over machines clothed with felts, to press out the surplus water, and to form a sheet. These felts are made of very coarse threads, and are of tremendous strength. Paper makers' felt jackets are heavily felted, tubular sleeves, that fit over the couch roller which rests on top of the moving fourdriner wire, and on which the sheet of paper is first formed. These heavy jackets, sometimes over half an inch in thickness, are felted to a size somewhat smaller than the circumference of the roller. They are then stretched out sufficiently to go over the roller, and afterwards shrunk on, when they become perfectly tight, keeping their place on the roller until they are worn out.

When paper was made by the hand process only, it was discovered that after shaking the water in which the paper stock was held in suspension over the wire screen,

and thus forming a sheet, a piece of woolen cloth, placed over the paper and pressed down upon it, when lifted, would carry the sheet of paper adhering to it. This quality of picking up paper, called "couching," so early recognized by makers of paper, was employed by the inventors of the machine process in the form of a woolen belt, or "carrier apron." The sheet of paper, having first been formed on a revolving cylinder, was thereafter picked off by the woolen belt, and carried on through the press rolls. This belt thus became not only a carrier, but also a filter or blotter by means of which surplus water was removed from the sheet of paper. From that time to this, the use of woolen felt as a carrier and filtering agent has been universal on all paper machines.

As the industry has grown, and the size of the paper machines has increased, these felts have become of very great length and width. In the manufacture of various kinds of heavy box-board, they sometimes reach the length of two hundred feet, and on newspaper making machines, a width of more than two hundred and forty inches will soon be in use. The service required of felts is very severe, and has grown steadily as the speed and size

of the machines has increased.

The manufacture of paper makers' felt began in this country in 1864. The industry grew rapidly and developed parallel to the development of paper manufacturing. Today the United States holds the foremost place in the world in the manufacture of all kinds of paper and pulp. Gradually mem-bers of the paper makers' felt industry became exporters. and today many nations are dependent upon the American paper makers' felt manufacturers as their source of supply. As paper makers' felt is an absolute necessity, the carrying on of their industry is contingent upon securing paper makers' felt from this country. The business of paper makers' felt is a branch of the woolen industry so specialized as to be little understood by the public in general, or even by the average woolen or textile manufacturer.

To produce belts of such large size, special machinery has been required, and has been developed, often by the felt manufacturers themselves. To illustrate,—looms over four hundred inches wide, napping machines with surface wide enough to nap cloth two hundred and forty inches wide, dryer cylinders of similar widths, and fulling mills capable of fulling a single piece weighing over one thousand pounds had to be developed. Such machinery and some of the unusual processes of manufacture are in-

variably of unusual interest to visitors to mills manufacturing paper makers' felts.

WOVEN FELT

Woven felts and mechanical cloths are also products of the woolen industry, and are closely related and very similar in nature to paper makers' felt. Woven felt originally was made of no other material than wool. Later experiments, proved that a mix of wool and cotton could be used to a certain extent for some purposes. The fabric is woven in the same manner as other woven cloths, and the name "felt," which is appended to the fabric, signifies a woven fabric, felted or fulled to a considerable degree. The manufacture is, in all essentials, the same as in all woolens.

Woven feltings are used today by manufacturers of practically everything under the sun. Paper manufacturers use and absolutely require woven felt. It is also a requirement in the manufacture of other textiles. Worsted manufacturers, thread manufacturers, and cotton mills have important uses to which they put woven felt. It is likewise used to a considerable extent on the cylinders of newspaper presses. It is a woven felt which is used as a covering of tennis balls, and for filtering purposes. Woven felt mills also produce cloths used by piano and player piano manufacturers.

The woven felt industry was started in the United States in 1871. The business started in a small way and grew gradually and steadily into an industry. There are at present eleven or twelve concerns in this country manufacturing woven felts, the industry is progressing rapidly and thriving, its product advancing in use in accordance with the rate of expansion of general manufacturing of other industries, which, in turn, employ and require woven felts.

LITHOGRAPHIC FELT

Lithographic felt is likewise a woven fabric. It is a cloth, heavily felted, and is directly connected with the woven felt industry, and is manufactured mostly by the same mills that produce woven felts. This cloth is used chiefly on printing and lithographic machines, and likewise for filtering purposes, etc. The application of the word "felt," here again simply signifies a cloth, heavily fulled or felted.

HATTERS' FELT

By far the largest percentage of felt hats is made, not as the layman would imagine, of felt piece goods, cut up, and blocked out, but in individual pieces, known to the trade as "bodies" or "shapes." It is difficult to obtain authentic information on the subject of the fur felt hat, if one desires to go back to its inception. Most authorities seem to believe that the art of felting insofar as the making of hats is concerned, was not known to the Greeks and Romans before the Christian Era, but that it was first introduced by the Crusaders, who found that the tents of the Saracens were made of wool or fur felt.

The expression, "mad as a hatter," may have originated from the fact that but few hats were worn in the early Middle Ages. so that makers of hats, or users of hats, were given but slight consideration, and were either directly accused of being, or else supposed to be "mad," by having permitted themselves to believe that a felt hat was either fashionable, serviceable or practical.

It is known that felt hats were made in this country sometime before the year 1780, as records show that there was a factory at Danbury, Connecticut, at that time. Shortly after the War of 1812, the making of felt hats really began in a larger way in this country. The hats of that period differ materially in weight from those of today. A hat of that period weighed about nine ounces, while the average hat used today, weighs approximately three ounces.

Fur felt hats are manufactured from the fur taken from various animals, such as the coney, which is the name of the foreign rabbit. They are also made from the fur of the otter, hare, beaver, muskrat, nutria, etc., etc. The fur of the American rabbit has not been proven very successful for use in making of hats. We have to rely upon shipments of skins from England, Scotland, Belgium, France, Austria and Australia for rabbit fur, while South America supplies the nutria skins. The fur from other water animals is collected from trappers in various countries, including our own.

The felt hat industry is, like every other industry, divided into different classes and branches. Some concerns specialize in the manufacture of fur felt hats, some of wool felt hats, others make chiefly hats for men, and again others confine their work exclusively to the production of hats for women.

The manufacturing processes of the different branches are primarily alike, but differ in detail. They are several hundred hat manufacturers in the country, and the industry is a large one. A felt hat is one of the very few articles of personal equipment which every user recognizes as being "felt."

Wool felt hats for women are sometimes made from felt piece goods. The felt is cut into squares, sized and stiffened, then blocked out into shapes on hydraulic presses. The edges are then trimmed, and the hat, now formed, is then completed in the same manner as is a body hat. This type of felt hat is usually of lower grade, and cheaper quality than a "bodied" hat. The operation is simple, nevertheless, and by far the largest percentage of the hat business is done in the individual form, or "body" type process, as there is far more permanency to a hat constructed by this latter method.

CUTTING INDUSTRY

People used to buy felt piece gcods, and cut out of them the gasket, washer, strip or pad that they needed. The demand for such "ready-to-use-size" felts increased rapidly, almost in advance of machinery, so it was rather natural for some men to go into the business of specializing in the cutting of such articles of felt, for the trade. The business started in a small way, but grew in leaps and bounds, so that at present there are many large concerns whose business is the exclusive cutting of felts of various kinds into washers, gaskets, buffers, bumpers, mats, pads, strips, oil rings, etc., of different weights, thicknesses, colors, qualities, textures, shapes, and sizes.

To illustrate the diversity of the requirements most felt specialists make washers cut into every conceivable size from one-eighth of an inch to twenty-four inches in diameter, and at the same time, many of hundreds of thicknesses, textures, and qualities. The chief source of supply of felt cutters for their material is, of course, the mills manufacturing textile felts. On the other hand, the customers of the felt cutters are manufacturers of almost everything else under the syn.

HAIR FELT

The hair of the cow, calf, and sometimes of other animals is the basic raw stock used in the manufacture of this product. The stock is carded and comes off the carding machine in batts. It is then formed into a pressed fabric by the employment of glue or sizings of other kinds. Hair felt is used for insulation purposes and likewise for soles of slippers and shoes. Hair felt is also used for packing and refrigeration purposes. Another large use to which it is put is in gun wads and percussion caps in ammunition of various kinds. There are, in this country, several large manufacturers of hair felt, and the industry has developed to a considerable

extent. Naturally the World War brought with it large requirements of hair felt for military purposes of innumerable kinds.

COTTON FELT

Cotton felt is made of carded cotton and used inside of mattresses and as stuffing or packing of beds. The manufacture of cotton felt is an industry all unto itself. There are a number of manufacturers of cotton felt in the United States, and the industry is considered as being sizable.

SHIP FELT

Ship felt, generally styled "Irish ship felt," is purely a flax product, and is made in Ireland. It is used for the calking of ships and under deck covers on wooden ships. It is an important item in connection with the ship-building industry, chiefly in the construction of wooden ships. Ship felt is a pressed fabric and its stiffness is obtained by the employment of sizing or glue of various kinds. To the best of the writer's knowledge and belief there is no ship felt whatever made in this country, and as it is only required in certain types of ship construction, there is not a great demand for it in America, probably due to the fact that we have not until recently attained an important place in the world as builders of a type of ships which require ship felt.

During the recent war, some types of wooden vessels built by our government necessitated the procurement of Irish ship felt. All that was available was obtained for the government and after this amount had been consumed, the United States Shipping Board ordered a change in the construction of additional vessels that were to be built in order to eliminate further requirements of the ship felt, and apparently managed to get along rather satisfactorily without it.

BUILDING FELT

Building felt is a product of the paper industry. Often it is called deadening felt, and is primarily a pulp and paper product made in a manner similar to the manufacture of cardboard It is used for the deadening of noises and sounds in the walls of buildings. Some styles of it are used for roofings. Building felt is sometimes made of rag stock, chiefly cotton rags. That for saturation with coal tar contains but very little wool stock. The felt is manufactured on a machine similar to that used for making ordinary paper. Variations in its operation determine the quality of the finished product. Sometimes jute is used in the making of building felts.

ROOFING FELT

The processes of manufacture in the production of roofing felt follow closely the processes established in the paper industry. Here the term "felt" is a misnomer, as felt, chiefly of wool, would be entirely unsuited for roofing purposes. A high grade roofing felt contains from fifty per cent to seventy-five per cent of cotton fibre, and a negligible percentage of wool. Often old papers are used to a limited extent. Materials used in making roofing felt are as follows:

Animal and vegetable fibres, as wool, cotton and linen, obtained from the maceration of rags, and rope.

Old paper, jute, flax-tow, hemp, etc., etc. Linters and mill fibres of the waste class. Fibrous wood products obtained by the sulphite and soda process.

Mineral fibres, usually of the asbestos series, but sometimes blown slag, mostly non-absorbent.

Clay, powdered limestone, or like earths, used as fillers and weight makers, which absorb little saturant and contribute no strength.

Sometimes woven textiles are used as reinforcement sheets.

Rarely, wire mesh, wire strands, and fibre cords or strings are used as reinforcements.

The pulp or felt, when saturated with coal tar pitch, is then surfaced with bitumen, becomes roofing, and is known as roofing felt. There are many different kinds, types, and styles of roofing felts. The industry is totally dissimilar to the other types of felts such as textile felts or paper makers' felts. The chief resemblance is only in the employment of the much-abused word, "felt," as roofing felts are far nearer a paper product than anything else. The industry in this country is very large and there are many successful, thriving, manufacturing institutions within it.

ASBESTOS FELT

The term, "asbestos felt," is another confusing title. It shares the family name of felt, and is entitled to it, no doubt, because the product is a pressed together one. Asbestos felts are used for roofing. Some of the large manufacturers produce them of pure asbestos fibre, employing no wood rulp or foreign matter of any description in their construction. The asbestos fibres are selected so that the felt, being porous, will absorb the greatest possible percentage of heavy, dense, asphaltic impregnated compound. In the course of manufacture, after the felts are impregnated, they are cemented together with an asphaltic compound com-

posed of several natural asphalts, softened with asphaltic base fluxing oils, and are then processed to give the necessary characteristics. Asbestos roofing felts are used for application over wood sheathing, cement or gypsum.

ASPHALT FELT

Asphalt felt is used chiefly for roofing materials. It is produced of fibres of different kinds, impregnated with asphaltic com-

pounds. Asphalt felt is closely related to roofing felt. Mention is made of it here simply because the old, abused word "felt" is attached as a descriptive handle by the trade. The most general use of asphalt felt is in connection with the building of roofs.

The industries mentioned above are not the only claimants to the family name of "felt," but they are the most important, and most used, and therefore the best known.



Dwight Mill, Chicopee, Mass., 1856

CHAPTER EIGHT

THE REWORKING OF WOOL AND COTTON. TEXTILE SUBSTITUTES IN THE MODERN MARKET

In all the realms of modern industry there is hardly a chapter more interesting than that which deals with the conservation of raw materials through the utilization of the worn-out products of industry. A great commercial mechanism has been constructed to collect and make suitable for re-utilization the innumerable articles cast away by the public, as well as the great accumulation among our factories and mills of that which for the want of a better term is named 'waste". The practice and science of reclamation is to-day highly organized and ramifies itself through all the divisions of economic activity. It has become a recognized duty of mankind not only to produce the substance of his existence, but also to conserve and reclaim for other purposes such commodities as have become unfit for the primary purposes of their production, or which may be re-worked to serve those purposes over and over again.

À significant fact bearing on the importance of reclamation is that the further advanced a country is in the arts of production the greater are its achievements in the utilization of by-products and broken down or worn-out manufactured articles. A high compliment was paid to the efficiency of the packing industry when a clever wag remarked: "The only thing that wasn't saved from the pig was the squeal." Almost the same metaphor can apply to the methods by which are handled the millions of tons of scrap iron, rubber, and fabric wastes which are constantly accumulating

in the modern industrial world.

The process of reclaiming the nation's cast-off apparel is a fascinating one, and its wide-spread effects are matters usually ignored by the average individual although they are essential to many of the comforts and luxuries which surround him. The average man gazes upon you with wonder when you remark that the newspaper, the cotton shirts, and the suit or overcoat which he casts away or sells for so much "junk" is to undergo an industrial metamorphosis and return again to serve him in the guise of paper-board, writing paper, or an overcoat.

A maze of economic transformations is undergone by an old suit of clothes from the time it is sold by a man's wife to the itinerant "junk-man" to the stage in which it is ultimately in such condition as to be displayed to him again in the polished showcase of his clothier. The first stage of the process deals with the task of collecting from the millions of homes throughout the nation, scattered far and wide in city, town, hamlet and farm, the cast-off clothing of the populace. This is to-day accomplished by the junk-collector, a patient solicitor and shrewd bargainer, engaged in a constant search for rags, rubber, metal, etc. His vocation requires not only the persistency of the peddler and the guile of a chancellor, but also the sturdy power to follow the most abject of callings to gain the none-the-less untarnishable lucre. For his effort he has been amply rewarded. Herein can be recognized one of the broad, fundamental, modern principles of economic justice. No matter what niche is held by the producer, energy and initiative have always been well rewarded in America. The economic balance-wheel is relentless. Whoever performs a service necessary to the economic welfare of the community receives plentiful fruit for his efforts. Many a foreign immigrant has come to our shores to engage in the junk-collecting business, ultimately to develop into wealthy operators controlling large warehouses. Some of them have continued their progress far beyond the stage of retail or wholesale dealers, but they or their sons have become manufacturers, controlling substantial plants for processing merchandise into a condition suitable for use as a raw material.

Rags are collected, together with other scrap materials and unusable articles, from the house-holder in a random state. That is, all cast-off apparel whether constructed of cotton, woolen, or mixed cotton and woolen fabrics are purchased together in one lot as mixed rags. The house-to-house collector sells his accumulations to an individual known in the trade as a "mixed rags" dealer. The latter separates the rags according to their fabric material, first sort-

The "mixed-rags" ing out the cotton rags. dealer now subdivides the woolen rags into two main grades which are known in the trade as mixed soft woolens and rough hard woolens. Mixed soft woolens include all soft woven or knit woolen goods, such as woolen sweaters, stockings, dress goods, soft serges, and soft coarse woolen fabrics. Rough hard woolens, in general, include

men's suitings and overcoatings.

Another source from which is available a superior quality of wool stock is known commercially as new woolen clippings. These are the cuttings that accumulate in tailor-shops and clothing manufactories. The superior quality of this stock lies in the fact that it is not derived from cloth that has been worn. New woolen clips retain to a surprising degree the original suppleness and strength of the virgin wool. The great advantage of a new woolen clipping over an old worn rag is in its fulling qualities, which are very much better. The serrations on the fibres are longer and therefore the fibres cling together more closely.

Commercially, the value of new woolen clippings is about twice that of woolen rags. In the large American cities which are centers for the manufacture of clothing, notably New York, Baltimore, and Rochester, New York, the volume of new woolen clips that is produced as a by-product of these establishments is so considerable that there is a special class of dealers who confine their operations largely to the buying and grading

of new woolen clips.

Returning to the mixed-rags dealer who has now separated his woolen and cotton rags, and at the same time sorted the woolen rags into soft and hard woolens or "softs' and "cloth"-the common nomenclature in the trade-we come to a consideration of the wool stock grader, whose activity consists of subdividing and "stripping" woolen rags in order to bring them a stage nearer to the mechanical process which achieves the real transformation of the product into its ultimate form. This process of collecting woolen rags from the households is a nation-wide activity, extending from coast to coast and penetrating into the smallest hamlets of the land. The secondary grading of woolen rags, however, is confined almost completely to the following cities: Chelsea, Massachusetts; New York City; Rochester and Buffalo, New York; Philadelphia: Chicago, Illinios; Cleveland, Ohio; and St. Louis, Missouri. Thousands of bales of "softs" and "cloth" are shipped annually into these cities to be graded and stripped. A significant fact to note is the shifting in recent years of the relative importance of some of these cities as grading centers. Twenty-five years ago most of the wool reworking activity of the country was largely concentrated in the northeastern section or the New England States. As a result, up to the beginning of the World War, Chelsea, a suburb of Boston, was the largest woolen rag center of the country. Carloads of woolen rags from the Gulf and the Pacific Coast States were usually shipped to Chel-The proximity of the consuming plants and the access to a plentiful supply of lowpriced foreign labor were the chief factors in building up the past predominance of this city as a woolen rag grading center. During the war there were nearly fifty concerns in Chelsea engaged in the grading and stripping of woolen rags. In the average concern about ten men were employed.

But this concentration of the industry on the north-eastern seaboard is gradually changing. The western and northern porof New York State have been coming to the fore as re-workers of old woolen rags. A shoddy' mill has even been inaugurated in the Chicago districts. The growth of the mackinaw cloth producing plants in the Middle West has contributed not a little in the occidental swing of the trade's center.

The East, however, still holds the premier position of woolen rag consumption. The preparation of rags, that is, the grading and stripping business, has shifted westward far more than the actual consumption. During the war the East experienced a great scarcity of the particular class of labor fitted to perform these operations. As a result Chicago and St. Louis made some progress as grading centers for those accumulations of rags gathered in their proximate districts.

But whatever advantages may develope in favor of the western growth of the industry, these can never offset the great advantages of the seaboard centers in the transacting of export business. The United States in normal times exports on the average about 1,500 bales of woolen rags per month. The great majority of these exports are routed to England. The British Isles are buyers of the coarse heavy grades of rags, which are not used extensively by American manufacturers. The English industry usually does a big foreign business in cloths and varns with Central Europe, Russia, and the Near and Far East. The bulk of this British export business consists of coarse cloth and yarns for the production of which reworked wool is a suitable raw material. About fifty per cent of the grades of woolen rags produced in this country are of varieties suitable for export and this stock is shipped through Boston, New York and Baltimore. This situation is greatly in the favor of carrying on grading and stripping operations in the East, because great quantities of rags must be shipped east anyhow for export.

The grading and stripping of rags constitutes an important process in the series of steps comprising the re-working of wool. The mixed soft woolen rags are sorted according to fabric and color. Serges, knit shoddy to its exact origin. It seems as if several persons had already begun the process by 1813 and according to Samuel Jubb, who in 1860 published a quaint "History of the Shoddy Trade," priority is usually assigned to one Benjamin Law who founded and conducted his business in Batley, England. A curious anecdote humorously explains how the reworked rags first came to be known commercially as "mungo." It is told how a very enthusiastic Yorkshire dealer had accumulated a considerable stock of



Old Amoskeag Foundry

stccks, and fine dress goods are packed separately and then subdivided into staple colors such as reds, greens, blues, etc. The hard woolen rags are first put through the "stripping" process which consists in ripping off the cotton linings. This process is done by hand and the workers are paid on a piece-work basis. The cotton lining outthrows which are thus ripped off from old vests, coats, and trousers are packed separately and are sold to roofing mills for the production of roofing paper. The stripped hard woolen rags are then packed in staple grades subdivided by colors.

The industry had its birth in England. It is very difficult to trace the manufacture of

shredded rags the sale of which he was pushing hard. A prospect expressed some dubious sentiments as to the value and salability of the stuff, and remarked to the dealer: "Why, that won go." To which the sturdy son of Yorkshire snapped back: "But it mun go!" ("mun" being the Yorkshire twang for "must").

The first machines used for shredding rags in order to work them up into a fluffy, bulky, fibrous mass suitable for spinning, were very primitive affairs. They were used for tearing up or shredding the rags. One explanation of the derivation of the terms shoddy is a manipulation of the word "shedding" which is itself a slight abbreviation of "shred-ing".

As soon as it was found out by the metropolitan press that cloth was being constructed from an admixture of shoddy and virgin wool a tremendous hue and cry was raised in the papers. A campaign of acrimonious denunciation was launched in headline and column against "this species of wool manufacture as militating against the morals and health of the people. lt may have been true that the original qualities of shoddy fabrics that were unloaded on the public were very shabby and justified the bitter invective which descended upon it from the highest sources of public opinion. But an industry, like the individual man. which cannot bear to receive criticism and profit by it, is not worthy of the name. The reworked wool has met by steady improvements the numerous objections which have striven to deny it a legitimate and honorable position wherever textile manufacturing thrives. The importance of the re-wor ing of wool cannot be better appreciated than by studying the methods used in the building up of a wool manufacturing industry in modernized Japan. Compared with other countries the wool manufacturing industry in Japan is still in its infancy. But even this country recognizes the fact that if it wishes to compete in the service of clothing with the peoples of the earth, the most efficient and thriftiest of policies must dominate manufacturing processes.

But the term shoddy with its odious connotations and its insinuations as to cheapness of quality and shabbiness of structure has survived, being often revived, to this day. As a matter of fact, so sharply has the public mind been impressed with denunciating propaganda that the term shoddy has become synonymous with deception and inferiority. How untrue this is the reader will soon be able to judge after he becomes acquainted with the highly specialized processes of sterilization and conditioning to which rags are subjected in their manufacture into re-worked wool.

There is a very interesting story told of the circumstances surrounding the original transplanting of the industry from England to the United States. As mentioned in a preceding chapter, in the early days of the country, particularly in the first part of the nineteenth century, it was forbidden by act of Parliament to export from the British Isles tools or machinery, a trade regulation which

to-day would seem absurd. One Richard Ardict, in 1831, living in the township of Dewsbury, at present the lar-

gest woolen rag center in the world, planned to embark to the United States where he intended to engage in the reworking of woolen rags, believing that far brighter opportunities awaited him in the new land. He purchased a rag-picking machine from George Archer who was at that time engaged in the building of textile machinery at Ossett. The machine was boxed up, put on board ship and billed on the lading documents as a rice-threshing machine. But before the vessel sailed on which Ardict intended to follow the machine, the scheme was discovered and the culprit jailed. After being sentenced to pay a fine of twenty-five pounds sterling, Ardict was released and he immediately sailed to New York. His machine awaited him there. He set up a place at Marlborough, New York. Here was launched and operated the first shoddy mill in the United States, known as the Hepworth Mill.

Let us now consider the various processes of re-working the rags. The peculiar manipulations render the finished product not only suitable as a raw material but also completely desirable from the hygienic and sanitary standpoint. The last stage in which we have left the rags finds them assorted according to texture and color. The hard woolens have been stripped clean of all cotton linings. This stock, however, in its present state cannot be termed all wool. Besides the numerous remnants of cotton threads remaining along the edges from which linings have been ripped, small pieces of cotton linings are still attached to the woolen portion. Moreover, many fabrics classified as woolen rags are not strictly all wool. These fabrics may have cotton threads worked into warp or introduced by numerous other methods. These cotton ingredients must be entirely eliminated before the re-worked wool is adequately fit for its ultimate purpose. If this cotton were allowed to remain through the shredding process the shoddy thus produced would not be strictly all-wool. The texture of the mass would be uneven and unless peculiar precautions were taken in the subsequent dyeing processes the cotton and the wool contents of the mass would react differently to the dyeing agent.

In view of the importance of the complete extraction of all the cotton matter in the rag fabric, it is most interesting to the layman to note how simple and effective a process has been developed for the performance of this task. The principle underlying this accomplishment is founded on the inherent difference in the natural constituency of wool and cotton. Wool is animal matter, being in a sense, a part of the body of the sheep.

Cotton, on the other hand, is vegetable matter, being derived from a plant. Each is composed of chemically different ingredients (which would, of course, react differently to treatment with other chemicals). Recognizing this fundamental difference between the two it became necessary, therefore, to get a chemical that would attack cotton and "eat" it away from the wool, which would also leave the woolen threads of the rag undamaged. Such a process has been developed to a very successful point. It is called carbonizing, derived from the fact that an acid is utilized which "burns up," so to speak, the cotton contents of the rag and leaves in its place a carbon residue which is subsequently dusted out.

Before the reclaimer of wool puts his rags through the carbonizing process, they are

water solution. This elimination of excessive dust and dirt from the rags results in making easier the process of carbonization and reduces the danger of injury to the wool fibre during subsequent agitating processes. In general, however, domestic rags are comparatively clean and are usually not put through any preliminary dusting or washing process. The process of carbonization has been the object of scientific experiment by some of the foremost technical minds of the world. It is essential that the temperature of the acid used be high enough to destory the cotton but not high enough to injure the condition of the wool fibre. Various kinds of rags and the various kinds of products anticipated require various kinds of treatment during carbonization, so far as concerns the strength of solution and the



Coolidge Mill of the Amoskeag Manufacturing Company

carefully examined. The fastidiousness of this examination depends on the accuracy of quality required in the ultimate product. Often-times a carelessness of sorting in the plants of the rag-graders allows the slipping in of color shades too dark or fabrics too coarse. These uneven pieces can be eliminated only by careful inspection. One of the discrepancies that must be carefully guarded against is the presence of any piece of fabric containing silk threads. Silk, being composed of animal matter, is not attacked by the acid, and its presence is subsequently revealed in an unsatisfactory manner by its failure to accept the dye identically with wool.

In some countries where rags are collected from remote districts it has been found a policy of economy to give them a dusting before they are placed in the acid bath. Cases are even known where they are first subjected to a washing in a weak soap and duration of the bath. The carbonizing process usually lasts from twenty to thirty minutes, while the temperature of the solution is maintained at from 150 to 210 degrees Fahrenheit.

Carbonizing is thus one of the fundamental processes in the reclamation of wool. To the mill operator it ensures a uniformity of content by eliminating the foreign matter. To the layman its chief significance is its effectiveness in destroying all possible nonhygienic matter and is the first of a series of processes which unite to render the product perfectly sanitary.

After the woolen rags have thus been carbonized the are removed from the acid bath and prepared for drving and then dusting. As the rags are still soaked up with the acid after having been removed from the bath, and as this acid can be used over again it is squeezed out from the rags with a machine called an extractor. This extrac-

tor is a circular container with small holes perforated through the sides and bottom. The rags are placed in the container and the container is then revolved at a high speed. The centrifugal force causes the rags to press against the sides of the container, the fluid to be sent through the perforations, and conducted back to the acid baths. Whatever acid is left in the rags after this process is removed by washing them in a neutralizing or alkaline solution.

A close examination of the rags at this stage of the process will disclose the fact that the cotton contents have been broken up by the action of the acid and carbon matter is left in the form of tiny particles of dust. When the rags are therefore thoroughly baked and dried this dust no longer adheres to the wool fibre and is then easily removed

by an ordinary dusting process.

The most modern method of drying or "baking" the carbonized rags involves the use of automatic machinery. A long chamber is constructed lined with pipes which contain steam. Within this heated chamber are arranged moving sheets of wire gauze, the surface of which is several feet wide and is constantly moving in a horizontal plane through an attachment of rollers. The rags are placed on the gauze sheets and are thus carried through the hot chamber and emerge thoroughly dried. The usual intensity of heat developed within the chamber is 145 degrees Fahrenheit. After having been dried the rags are fed to a dusting machine which is built on the principles of the willow. They thus emerge from the duster in an allwool dry state and free of all foreign matter. This purity is further insured by giving the rags a thorough washing after dusting. The washing not only cleans the rags thoroughly but also removes any remaining traces of acid which might interfere with the subsequent dyeing process.

It will be remembered that in the original sorting of rags in the warehouse of the wool stock grader and stripper they were classified according to color as well as to texture. That is, serges, knit stock, etc., were packed as, for instance, red serges, blue knits, dark worsteds, blue cloth, etc. The segregation of rags by color had as its ultimate purpose the facilitation of subsequent re-dying. Much less dye would be necessary if the desired coloring agent were applied to rags which had previously been dyed the same color and which still retained more or less of that same color. When, however, it is desired to give the rags some special blend or color with which the presence of the old colors would interfere, the rags are treated

with chemicals which "strip off" the old coloring matter and leave a neutral base for the application of any specially desired shade. The ultimate dyeing is rarely accomplished at this stage of the process, but usually is introduced into the yarn or into

the finished piece goods.

The rags are now ready for the shredding process, the aim of which is to separate the threads of the fabric to form a bulky fibreus mass similar to the condition of virgin wool before it is carded or combed. However, before the rags are fed into the the picking machine (so called because its essential part is comprised of sharp, pointed projections which fasten themselves in the fabric and pick or tear it into shreds) they must first be conditioned. The conditioning process aims to produce a pliant strength in the fibers and render easy their working out in the picking machine. The rags are spread out on the floor in a "batch" and are conditioned by being sprinkled freely with oil. This process is also essential in the preparation of virgin wool. The object of oiling the rags, as in the case of virgin wool, is twofold. First, in the carbonizing, baking, and 'dye stripping' processes a great deal of the natural fat contents of the wool fibres have been removed. This leaves the fibres dry The projections of the serand brittle. rations are also in a dessicated condition. The strength of the fibre in this super-dry state is naturally impaired. Any subsequent manipulation of the rags through the picking machine without processing would seriously injure the fibres so that the quality of the cloth ultimately produced therefrom would be defective. The oil restores most of the natural strength and pliancy of the fibre, thus contributing to the restoration of its wearing power in the finished fabric. In addition, the lubricating qualities of the oil render its processing through the picker easier, because they slip along the "teeth" and against each other, smoothly.

After the rags have been sprinkled with oil they are left to soak for an interval ranging from twelve to seventy-two hours according to the kind of rags being worked out and also according to the grade of oil. One authority states:..... on very hard worsted stock three days is none too long and makes the material pick easier and card better. It is best to have the oil boiling hot

when applying on rags."

The rags are now completely prepared for their final series of operations which come under the general head of shredding. They are manipulated through several types of machines—picker, card, or garnet—the

object of all of which is to separate the wool fibres from their closely woven state in the rag fabric and to work them up in a fluffy fibrous mass, ready to be blended with vir-

gin wool and spun into yarn.

In the process described above an old worn-out rag containing some wool fibres is converted into a remarkably useful raw material. The perfection of that process has thus far required the practice and research of a century and a quarter. To-day this country is dotted with plants whose main business is the reclamation of wool fibres from worn-out fabrics.

Below are some significant statistics on the size of the wool reclamation industry in the United States and its relative importance in the textile industry of the nation. All figures are quoted from the United States Census of Wool Manufacturers.

paigns launched on a huge scale. Various movements have on many occasions been inaugurated and to-day are well concentrated to enforce the branding of all fabrics which contain woolen stock other than the virgin wool. Virgin wool describes only such as, having been removed from the sheep's back, is for the first time being used in the construction of cloth. Re-worked wool, or "shoddy," is usually intended to describe such wool fibres as have been worked up again from worn-out clothing in the manner previously described. various sides of this controversy offer fruitful grounds for study as the points at issue are of such a fundamental nature as to be of prime interest to the public.

A bad name once acquired is hard to lose. The public shake their heads at the name shoddy and legislation for and against it ap-

Principal Materials Used in Wool Manufacturing

Scoured Wool Hair (camel, mohair and other animal hairs) Rags, Clippings, etc. Recovered Wool Fibre Waste and Noils (Wool Mohair, Camel hair, etc.)	44,131,227 62,083,106 30,158,915	1909 pounds 352,478,605 38,707,738 42,044,854 24,877,557 35,361,846 1904
Comparison of Virgin and Re-worked Fibres Used in Manufacturing Wool		
Scoured Wool	932 352,478,605	pounds 282,194,618 43,485,426
Total of Virgin Fibres 351,837, Recovered Wool Fibre 70,946,2		325,680,044 106,584,050
Total Wool Fibres 422,783,4 Cotton 35,307,6		432,264,094 36,593,401
Total	503 475,556,394	468,857,495
Percentages of Virgin and Re-worked Fibres Used In Wool Manufacturing		
Wool and Hair 76.8 per Re-worked Fibre 15.5 per Cotton 7.7 per	cent 82.1 per cent cent 12.2 per cent	
Machinery Used In The Re-working of Wool,		
Pickers		1904 1812 245
Persons Employed In The Re-working of Wool		
All Classes 22 Male 1' Female 1 16 years of age and over 2	914 1909 391 2177 937 1732 454 445 387 2175	1904 No record No record
Under 16 years of age	4 2	

In discussing the sources and uses of reworked wool it is fitting to consider the question of labelling fabrics in which it is used. It is fair, however, to present both sides of the question. The public has been the recipient of well organized propaganda in cam-

pears in our Congressional programs. It is doubtful if the country could grow enough sheep to supply the demand for wool used in the retail trade. At all events, modern shoddy appearing in cheviot form from the softs and as the backing of tweeds from the hard fibres supplies a cheap, warm clothing for many who must rely on wool as protection against our climate and are forced to restrict their expenditure for clothing below the price demanded for virgin wool fabrics.

A brief history of the question is given below. The year 1906 marked the passage by Congress of a series of laws to protect the quality of the nation's food. This was the Food and Drugs Act. The preceding decade, however, witnessed also the growth of agitation to legislate on the contents of cloth, but Congress, while recognizing the absolutely essential nature of the need for regulating the standards of food ingredients, did not see any corresponding need for similar legislation on cloth manufacturing. Off and on, for the last twenty years, various groups have recurringly introduced bills into Congress advocating various schemes for the branding of cloth so as to show the percentage of virgin wool and of other ma-

terials used in its construction.

The National Sheep and Wool Bureau, with headquarters at Chicago, an organization founded for the promotion of the wool growing interest in the United States, now appears to be the most active and effective agency striving to obtain the passage of labelling laws. The Consumers' League, an organization representing itself as the guardian of the general public's welfare, has also engaged actively in the campaign for labelling cloth contents. Some manufacturing interests whose plants are widely advertised as producers of virgin wool fabrics only are also well to the front in pressing demands for labelling. Contrasted to these is the general body of American manufacturers of wool and worsted fabrics who are strongly opposed to the various measures proposed to achieve the oft expressed idealistic objective which is sought by both contending sides. The manufacturers are supporting a bill which aims to protect the public from fraud and misrepresentation, although along lines markedly different from those advocated by the wool growing interests, by the virgin wool manufacturing interests, and by those who watchfully guard the public's interests.

The two most prominent bills before Congress at the present writing which vividly represent the two contrary views of the opposing sides as to the character of the most desirable legislation are the French Bill, which is being urged by the virgin wool interests, and the Rogers Bill, which is being advocated by the general wool manufacturers of the country. The French Bill, which has given to itself the

appellation of "The Truth In Fabric Law," aims "To prevent deceit and profiteering that result from the unrevealed presence of substitutes for virgin wool in woven fabrics purporting to contain wool, or articles of apparel made therefrom . . ." important phases of the bill are as follows: That every manufacturer of woven fabrics purporting to contain wool, and of garments or articles made therefrom, shall, before offering such fabric or garment or article of apparel for sale, . . . cause the said woven fabric to be stamped, and all garments and articles of apparel made therefrom to be tagged . . . (containing) in a manner that shall be legible, the following information, in the form hereinafter described: The contents of the fabric, stating the four following ingredients as herein defined: Virgin wool, shoddy, cotton, and silk, and the relative proportion or percentage of each, together with the registration number of the person, firm or corporation making the fabric or cloth. . . . That the term 'virgin wool' as used in this Act shall mean wool that has never previously been spun or woven into cloth; the term 'shoddy' shall include any material obtained from any fabric or clippings of cloth of any fibre whatever, or secured from rags or from used apparel of any description, or any fibre that has been previously spun or woven into cloth, as well as wood, hemp, jute, flax, and hair fibre not properly classed as wool of any description and from whatever source obtained, also furs, feathers of every description and from whatever source obtained. The term 'cotten' shall mean cotton fibre that has never been previously spun or woven into cloth, and the term 'silk' shall mean silk fibre that has never been previously spun or woven into cloth.

"It can be seen from the above that the main purpose was to specify the ingredients other than wool contained in cloth and furthermore to specify as 'shoddy' all ingredients whose fibres had been previously spun or woven into cloth, no matter from what source obtained.

"Below are given the essential portions of the Rogers Bill which has received the endorsement of the wool manufacturing interests of the country. Its aim is 'to protect the public against fraud by prohibiting the manufacture, sale, or transportation in interstate commerce of misbranded, misrepresented, or falsely described articles, to regulate traffic therein, and for other purposes.

"That for the purposes of this act an article shall be deemed to be misbranded or

misrepresented——

"First. If it be an imitation of and offered for sale under the name of another article or with a name or brand so nearly like it as to deceive purchasers as to its origin and character.

"Second. If the contents of the package, as originally put up, shall have been removed, in whole or in part, and other contents shall have been placed therein with intent to deceive.

Third. If in package form, and the contents are stated in terms of weight, measure, numerical count or quality, they are not plainly and correctly stated on the outside of the package, or are stated in such manner as to deceive or mislead the purchaser or be designed or calculated so to deceive or mislead such purchaser."

It is evident that the objects of the French Bill and the Rogers Bill are quite different in character and method, although the primary purpose of each purports to be the protection of the public. The Rogers Bill is general in character; its regulations embrace all commodities. The French Bill singles out woolen and worsted cloth only. The French Bill legislates against the unlabelled use of certain materials in the construction of cloth. The Rogers Bill legislates against the fraudulent description of merchandise. The French Bill takes for granted that all forms of fibres that have previously been spun or woven into cloth are so distinctly of an inferior nature that public protection requires their presence to be made known by labelling; and that the term "all-wool" is a deceptive one if any part of that wool has previously been spun or woven into cloth.

Now the French Bill would undoubtedly be a highly desirable piece of legislation. provided, that its premises and presumptions were accurate. If absolutely all grades of virgin wool were superior to all grades of reworked wool, and if the properties of reworked wool were peculiarly contrary in quality to the properties of virgin wool, then the advocacy of the French Bill might have a reasonable foundation. For instance, if all grades of virgin wool in general were more sanitary or had greater insulating power or possessed a remarkably greater wearing power so that the substitution of the reworked fibres at any time would unquestionably detract from the essential properties of the cloth, although the general appearance of the cloth were unaffected, then no intelligent observer could deny the justification for the particularized objects of the French Bill.

The hearings before Congress established by actual exhibit the fact that many fabrics constructed of mixtures of virgin wool and reworked wool were vastly superior in appearance and quality to a cheap fabric constructed of very inferior grades of virgin Frederic S. Clark, in his statement at the hearing, brought out the following

undisputed points:

The quality of the fabric is not determined by the material content alone. Because of the easy acceptance by the public of the implied claim that the quality of fabrics has a definite relation to the percentage of new wool in them, fabrics made of all virgin wool and so branded under this bill must be expected to sell at a premium. The statement that a fabric is made of "100 per cent virgin wool" will serve as a claim of high quality. Any fabrics bearing it will find more ready sale than others, regardless of merit. The use of substitute material makes it possible to produce fabrics to sell at medium and low prices which have many of the desirable qualities of high-priced fa-As will be brought out later, the methods by which modern business is conducted make it very rare for these mixed fabrics to be sold except for what they are. By this law undue suspicions would be thrown about all fabrics, whether woolens or worsteds, bearing any mark except one claiming 100 per cent new wool. Many fabrics, now sold on their merits as mixed fabrics and without deception of the public, would be obliged to overcome a public branding which puts an undeserved stigma on them.

'Now, if these terms, virgin wool, shoddy and cotton respectively indicated a fibre of unvarying characteristics, then the statement of the percentage of each in a fabric might give the buyer some information as to its quality and value. I have shown you but a very few of the countless varieties of those different fibres and you have seen that each class in itself varies tremendously in length of staple, fineness, strength, general qualities and cost. You have also seen that some shoddy is vastly better than some virgin wool. Under these actual conditions what but confusing information is conveyed to the buyer by this stamping, which tells him nothing of the qualities of the different fibres. . . . The general prejudice in favor of virgin wool and against shoddy has no adequate sanction. In fact, there is a general popular prejudice, in favor of virgin wool, no matter how poor, and against reworked wool, no matter how good. Neither of these prejudices would persist in this in-

discriminate form if the public knew how poor a virgin wool can be and how good a reworked wool can be. These prejudices are the basis of the feeling on the part of many people that if they knew the fibre content of a fabric they could judge of its

value. This idea is wholly false!

Before bringing to a close the discussion of this important matter of fabric legislation which has been peculiarly important to the vital interests of the wool reclamation industry ever since the London papers more than a century ago cried out with bitterness against the cheating of the public by shoddy cloth up to the modern movement against reworked wool by thousands of organized sheep-men-let us consider how the entire proposition can be satisfactorily handled with the equitable tender of justice both to the reworked wool and the virgin wool industries, at the same time bearing in mind the ever-to-be considered welfare of the public.

It is an axiom in economics that under free competition value always forges to the front. If various grades or classes of commodities are given an unhampered right of way in the channels of trade, if all are granted fair and equal opportunities of production, advertising, distribution, etc., in the long run, after the public has had the time to interpret the lessons of experience, leadership in marketing success will go to that grade of commodity which offers the greatest value per unit of price or greatest value per dollar. Whatever commodity is offered on the market, whether it be clothing, food stuffs, or mechanical goods, the relentless formula for continued sales success is quantity per unit of price. One of the greatest of all sayings that is perpetually being proved in the race of modern business is:

You can fool all of the people part of the time and part of the people all of the time, but you cannot fool all of the people all of And under the alert influences of modern business the foolable portions of this proverb are ever becoming more lim-

ited.

Let it be granted that in many instances the properties of virgin wool fabrics may be in themselves superior to the properties of fabrics containing reworked wool in their construction. Such a declaration would be but a manipulation of the true state of af-Price is an essential factor in the establishment of value. If virgin wool fabrics are superior to the other variety they have ample opportunity to establish their distinction of superiority. In fact this has already been established in many varieties

of fabrics which contain no reworked wool at all. Quoting from the brief presented by the National Association of Wool Manufacturers to the committee of Congress: "... in England, in normal times, about a quarter of the fibre used in producing all wool fabrics is reworked wool and in this country the percentage is less. By the census of 1914 the total of reworked wool used in the American woolen and worsted industries was 85,000,000 pounds compared with the 434,000,000 pounds of new wool. It is clear that a material used on such a scale must have a legitimate place in the industry and that instead of being an adulterant in the ordinary sense reworked wool is a supplement to the new wool stock. would tell the consumer nothing of value to indicate to him, regardless of quality, the percentages of various kinds of stock. On the contrary, his judgment would be distorted and the manufacturer would find it commercially impracticable to use many excellent materials of low price.

In treating of the substitutes for virgin wool, it is appropriate to consider the great quantities of usable raw material accumulating daily in the textile manufacturing plants of the country, which is commercially classified as waste. Wool waste, cotton waste, and silk waste originate during the various processes to which these fibres are subjected. From the very first stages of machine manipulation of the raw material until the final finishing processes that are applied to the ultimate product, there accumulates at each stage a particular kind of waste. These out-throws, while unsuitable for the specific purpose for which the raw material is being machined, are, nevertheless, valuable by-products suitable for consumption in other textile processes. Millions of pounds of cotton waste accumulate annually among the mills. Much of it is exported to England, France, Belgium, and Germany. Similarly, we import great quantities of woolen and worsted mill waste from England and the Continent.

In the earlier stages of cotton manufacturing, the matter of mill waste was not given the careful attention that is now directed to it. The percentage of out-throws was far greater than at present, and the final disposition of the waste was achieved in a far from business-like manner when compared with the highly developed system prevailing to-day. A certain percentage of waste must necessarily be produced in the course of those processes which are purposely intended to clean raw material and to remove both foreign matter and fibres that are too short to be used for the specific purpose in view. On the other hand, great quantities of waste accumulate because of poor or illadjusted machinery, and through the negligence or incompetence of workmen.

The cotton in its progress from raw material to yarn is manipulated first, by the bale breakers, openers, scutchers, carding machines, combing and spinning machines. It is generally estimated that the initial processes of the openers and scutchers remove about six per cent of the cotton as waste; carding machines throw out about six or seven per cent; and the combing machines separate as waste anywhere from 15 per cent to 20 per cent. The bulky waste that accumulates during the preliminary cleaning processes and is produced largely in the blower room is known as fly waste. This description is applied in order to distinguish those kinds of waste which fall off or off" from machinery from those grades of waste which remain on the machines and have to be stripped off.

The carding machine is a comparatively prolific producer of waste. The purpose of this machine is to separate and loosen up the fibres of the raw material and to remove bits of leaves, sand, motes, etc. Waste known as strips is removed from this machine. There have been many inventions along the lines of brushes and knives to pull off this waste, but the latest and most efficient method is the use of a vacuum machine which pulls the material off by suction. Comber waste, as the name implies, originates at the combing machines where the short fibres are eliminated. While the cotton is in the form of a roving and is being drawn and re-drawn preparatory to spinning, it is liable to receive imperfections in the following ways: uneveness in drawing, dirtiness or stains, and breakages. Similarly, the spinning operations through carelessness or maladjustment may result in broken-up threads and snarling. These are all cut away and accumulate as thread waste.

There are many uses for cotton waste. Those grades which are suitable for re-spinning have very often a value as high as that of unused cotton. The lower grades are used for the manufacture of coarse towelings, scrubbing cloths, dish rags, cheap cotton blankets and flannelettes. It is customary to use the yarns which are made from cotton waste for weft or filling purposes in the construction of fabrics in which fine new cotton yarns are used for warps. Thread wastes are machined out to form a mass of threads of uniform compactness and are sold for wiping purposes to industries where

much machinery is employed, entailing a need for plenty of material with which to wipe the oily portions of the machines. The railroads of the country are particularly large users of thread waste for machinery wiping purposes. Fly and picker waste, as well as the great quantities of linters which are produced at the ginneries are utilized by the furniture and upholstery trades for wadding purposes. In the utilization of these various kinds of waste, specialized technical processes have been developed which reclaim from each grade a desirable portion and work it up into a state suitable for the specific purpose in view.

When cotton and cotton waste prices are on a high level, some manufacturers make a practice of shredding white cotton rags to produce shoddy, ordinarily used by mattress manufacturers, but sometimes mixed with raw cotton and woven into cloth. On the other hand, during a depressed market when prices are low, large quantities of white cotton rags are diverted from this form of consumption and are bought up by paper manufacturers for the making of bond and linen writing paper. White cotton rags go into the construction of the world's finest bond paper. The inferior grades of colored and dirty cotton rags are utilized in the manufacture of coarse, heavy roofing paper.

Wool waste originates similarly to cotton waste. That is, the combing, carding, drawing, and spinning machines each produce a certain kind of rejected material. The purpose of the combing machine is to separate the short fibres so as to leave in the raw material such staple only as is long enough for worsted spinning. The short fibres thus eliminated are commercially known as noils. The woolen mills producing heavy fabrics such as overcoatings, blankets and cheap suitings are great consumers of noils. Woolen card waste is also utilized for spinning into yarns and is used as a raw material for low grade woolen goods. Ring waste, originating on the spinning rings, and thread waste which accumulates on the spinning frames form a considerable proportion of the wool waste list. During the spinning process both in woolen and worsted yarn manufacture, quantities of waste regularly accumulate which is known as hard ends. In being re-used, these woolen and worsted hard ends are put through garnetting machines which open them up and work the material back again into a loose and bulky state. Wool waste accumulates even during the final finishing processes after the raw material has been worked up as cloth. During the fulling process which works up the surface of the cloth to obtain a hair-like effect and during the cloth-shearing process, a type of waste is produced which is very short-fibred. This is known as flocks. When wool prices are very high, flocks are often used in the construction of very coarse and cheap fabrics. Ordinarily, a great portion of the flocks produced are utilized in the upholstery and mattress trades for stuffing purposes.

Great business organizations have been developed whose sole attention is directed to the purchasing and selling of mill wastes. The usual method by which a cotton or woolen mill disposes of its waste textile products is by contract for the entire year. The month of January is usually given up

to contracting and the dealers enter negotiations with the manufacturers for the purpose of purchasing their entire waste production for the ensuing year. Similarly, the dealers themselves aim to dispose of as much of their purchase as is possible by contract, but very often dealers take the chance of buying up wastes for the whole year and taking a chance on playing the market as regards the selling. In the cotton waste trade, rovings and spinning waste are essentially as valuable as the raw material. The custom has arisen whereby dealers contract to buy these grades from the mills throughout the year on a percentage basis so that the purchase price fluctuates at a given percentage of the current market price of spot cotton.



Old Manchester Mill, Manchester, N. H.

CHAPTER NINE

THE MARVELOUS PRODUCTS OF THE CARPET MILLS OF AMERICA

Carpet making in the United States, as a business proposition of any importance dates back only to the time when the first carpet factory was established in Philadelphia in Before that carpets were made, of course, but the industry was of a desultory character and of small importance commercially. In colonial times carpets were a luxury for the wealthy only; perhaps our ancestors were content to have clean sand on their floors occasionally and if they were lucky to have advanced in this world's goods, they might have had a hand-made rug carpet for the "best" room if there was one. Perhaps our great-great-grandmothers braided a rug from the cast-off clothes of the family to lay before the open fire-place which did duty for heating, lighting and the simple cookery of the day. These were, indeed, the luxuries of the day. and most families were well content if the good housewife scrubbed the floors with sand, soft soap and water once a week and then sprinkled them with clean white sand.

It is only within a hundred years that the power weaving came into existence and means were thus provided whereby carpets and rugs came within the reach of people of ordinary resources. In the early days of carpet making on hand looms, the work was slow and hard. There are hand looms in operation today, built on the same old lines, used by the operators to make the same old style carpets which sell for prices that compare with modern floor carpets because they are "antiques up to date." A good weaver could possibly produce five yards daily on the hand loom. This product was very uneven in texture for as he became tired, the weaving would become looser and in no way a match for the first yard or two. Where patterns were attempted, it was impossible to secure anything near a match. Carpet factories were started in the early days in an endeavor to produce floor coverings on something like a commercial scale, as it was looked upon then, but history does not show that many of them were particularly successful, nor that they enjoyed long lives. The fabrics of the Orient, even at that time, were looked upon as a criterion; the lowly

carpets of the then modern days did not appeal to the wealthy class; and the poorer could seldom afford the cost of even the domestic article.

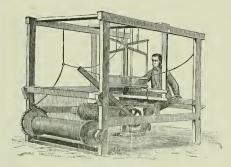
Probably the earliest organized factory for the manufacturing of carpets was established in Paris in 1607 in the Louvre. This mill made what was known as the "Turkey stitch," an imitation of the Turkish carpet. In 1745 a factory was established in Wilton, England, on capital furnished by the Earl of Pembroke, which was the birthplace of the Wilton carpet. The first carpet factory in America, as stated above, was established in Philadelphia, in the Germantown district in 1760, and within the next few years there were many more in operation, but none of them seem to have lasted

Invention came to the rescue of the carpet makers when Americans began to make improvements that paved the way for real enterprise and expansion in making textiles for floor coverings, placing America in the first rank in the carpet weaving industry, and at the same time putting real and artistic floor coverings within the reach of practically every home. In 1825, Alexander Wright built a carpet mill at Medway, Massachusetts, but sold it in 1828 to the Lowell Manufacturing Company. The business was then moved to Lowell. about the same time Orrin Thompson founded the business that later became the Hartford Carpet Company, granted a charter by the legislature in May, 1828. This company began operations at Thomp-

sonville with fifty hand looms.

Some time before this a Frenchman by the name of Jacquard had devised an attachment for looms weaving lighter fabrics but it had not been adaptable to the heavier texture of carpets. One of the workmen in the Lowell mill invented an adaptation of the Jacquard device that enabled him to attach it to an ingrain loom. Jacquard made this invention in 1801, and it marked a distinct epoch in textile manufacturing of goods requiring a pattern, as by this process the design can be produced in the cloth with absolute accuracy. When the Lowell operative adapted it to use in

carpet making, and particularly when the work was accomplished by power, it was probably the greatest single accomplishment for good in the business. The matching of figures when the lengths were sewed was perfect, a result hard to obtain before this, if it was attained at all.



The Old Style Hand Loom for Weaving

The Jacquard, at the top of the loom, consists of a great number of cords and an arrangement of wires that might be likened to those of a type-writer. The cords extend to the place of weaving where the yarns run through little eyelets on the cords. A set of cards punched with holes to correspond with the design, that is, the little checks on the design paper, revolves on a cylinder, and each card presses in turn on another cylinder covered with needles. These needles slide through where there are holes in the card, and control certain threads which bring up the yarn required to form the pattern. The principle is similar to the manner in which the music is produced in a piano-player. The ingrain. Brussels and Wilton are made with the use of the Jacquard attachment.

About the time that the man in the Lowell mill had adapted the Jacquard to the making of carpets, another employee of the mill invented a loom to be driven by power. This man was Erastus B. Bigelow, and his name will always stand high in the annals of this industry. Aided financially by the treasurer of the company for which he worked, he succeeded in producing a power-driven loom for the making of ingrain carpets in 1839. This was undoubtedly the greatest development in the making of carpets in the history of the industry. It lifted their manufacture from the plane of a slow, laborious, plodding process to rapid duplication by power; no longer was it necessary for a human being to give his animal strength to production. Machinery would do the work and the human intellect would control it. Water and steam worked the bidding of man, and man's efforts were multiplied enormously while the cost of production was lowered materially. With the Jacquard attachment to insure perfect patterns and power driven looms to do the work, it became possible to produce far better carpets and at a far less cost than ever before. Other carpet men saw the immense value of the power looms, indeed they realized that they must utilize them or relinquish the field, and they secured the right to use them on a royalty basis for mills in Thompsonville, Tariffville, and elsewhere.

In Philadelphia the first manufacture of carpets on any considerable scale was by William Peter Sprague in 1791. Sprague opened a shop for this purpose on North Second street. Isaac Macauley opened a carpet mill in 1810 and operated it continuously for twenty-seven years. He is credited with having made the first Brussels carpet in America. Since that time there have been many illustrious carpet manufacturers in the City of Brotherly Love and the names of McCallum, Ivins, Dietz & Magee, Hogg & Metzger, Horner, Kitchenman & Neal, and Gay & Crow, revive old memories. The art, brought from the mother country, has remained to this day a distinctive craft in this section, owned and operated by those of English, Irish and



As First Made in the Orient

Scotch ancestry or birth. As if by clannish common consent, nearly all the manufacturers located their establishments in the Kensington district. For three-quarters of a century Philadelphia was famous for her production of ingrain and Venetian hall and stair carpets and other grades as they were

introduced and invented. But it was not until after the Civil War that the really tremendous growth began, and by 1870 the factories, great and small, numbered two hundred and fifteen. Shortly afterward power looms rapidly began to replace the old hand looms and gave another wonder-

ful impetus to the trade.

Weaving on the old hand loom was essentially hard work and considerable strain on the human frame. The setting beam with which the weaver packed the filling yarns, one against the other after each passage of the shuttle, was a heavy four-inch square piece of pine, which greatly taxed the arms of the operator. The treadle, too, kept one foot and leg in constant motion. Crouched down on a hard wooden bench with the whole body engaged, the weaver's posture was anything but pleasant and his wages were well earned. With the power loom these conditions were all reversed and the weaver stands by, an interested but not overworked participant. Women are poorly adapted to the hand loom though some essayed the work in order to earn some of the necessities of life for their families. Power looms made it possible to introduce fine shadings without introducing stripes at the same time.

The Murkland loom is celebrated for its shading qualities and the carpets produced have a decided Brussels effect. We mention the Murkland loom because it was really the first power loom to be adopted and used exclusively in weaving ingrain carpets in Philadelphia. There were many other attempts to install power looms but all were found to be faulty or appeared before the condition of the industry

called for them.

Alfred Jenks, the founder of the Bridesburg Manufacturing Company, was born in Pawtucket, R. I., March 17, 1793. He became an early student of textile manufacture and was especially favored by his friendship with Samuel Slater, an eminent pioneer in the cotton industry. Mr. Jenks came from Rhode Island to Holmsburg (now part of Philadelphia) in 1810 and was engaged in building machines, mainly for cotton manufacture. About nine years later he removed to Bridesburg and worked on woolen machinery, including looms and spinning mules. In 1837, Mr. Jenks completed a power loom to weave ingrain carpets. Some of the fabric made was placed on exhibition in the Franklin Institute. This was the first power carpet loom to be built in Philadelphia. There were sixteen shuttle boxes, eight on each side and in many points the loom as it stands is very similar to the power looms of today. It was during this same period that the Bigelow ingrain loom was completed in Massachusetts, but which was first to begin operations cannot be quite determined. It seems to be true, however, that the Jenks loom was not the equal of the Bigelow loom for carpets and it did not survive.

John Markley, next to Alfred Jenks, made the most decisive step towards introducing power weaving, and under the direction of James Eckles, he built ten looms



ERASTUS B. BIGELOW
Inventor of the Power Loom for Carpet Weaving

and erected them in a shop at Sixth and Jefferson streets Philadelphia, about 1945. These machines did not work well and they were finally sold for old iron. Another set of looms about contemporaneous with those of the Bigelow loom were installed by the New Jersey & Little Falls Carpet Co., organized in New York in 1823, and extending its business afterwards to Communipaw and Little Falls. One Nicholas Haight was the inventor and also the manager of the company. These looms were set up about 1840 at Little Falls, N. J., by Robert Beattie. The mill was short lived for the looms were evidently not efficient. These cast-off looms all embodied principles that afterwards were

utilized and made effective, and lifted other inventors to fortune and fame.

The invention of Erastus B. Bigelow of Lowell, Massachusetts, was actually the first successful power carpet loom made and used in New England, as noted. So perfect were its productions that the Lowell Manufacturing Company and others of New England which had adopted it were unwilling to have it used by other manufacturers and as a consequence many other inventive geniuses were put to it to produce something to equal the efficiency of the Bigelow power loom. The various inventions mentioned were among them. There were some awkward features to the Bigelow loom-first, its enormous height, requiring special buildings for operation; second, its extraordinary cost; and third, its complicated mechanism, requiring operatives of considerable skill to manipulate it. While these features cannot detract from the honor due its inventor, they constituted serious handicaps to its general introduction.

The Murkland ingrain loom was the invention of a man who had worked on the Bigelow loom. Murkland produced the speediest and best ingrain power loom of that important era. Today there are hundreds in use in the mills at Philadelphia,

and not a few in New England.

The Braun power loom was next invented by John Braun, a German, who came to Philadelphia in 1852 and made known his invention in 1864. This was the most successful of any invented in Phila-

delphia.

John Dornan, besides aiding Murkland to obtain a foothold in the manufacturing world, suggested and applied improvements to that already noted machine, and perfected himself, two- and three-ply ingrain looms, remarkable for their ingenuity as well as their simplicity. The Dornan carpet loom is thus described: "The Dornan ingrain weaving carpet needle loom is arranged for sixteen colored wefts, the vertical lifters being arranged in two ranks and the threads being passed through holes so that the thread suited to the pattern is lifted into the eve of the carrier-needle and carried into the middle of the shed where it is met by a hook which catches the weft thread and returns it to the other selvage where it is knit in by the latch needle. The Jacquard mechanism deter-mines the selection of the colored weft thread by raising the weft lifter. spools of yarn are placed on skeletons on a frame upon the floor. A part of the pattern is given by the warps of solid color, being due to the concurrence of the same colors in the warps and weft. The warp is laid double in the shed. A forked temple is combined with the jaw temple and a finger extending over the jaw holds the several weft threads in position. The lay operates the let-off and take-up and the connection with the lay is controlled by a pivoted piece. The Jacquard has a counterpoise motion, having one top board and two trap boards. The journals are operated by hooked bars placed in position in and out of gear with the sides

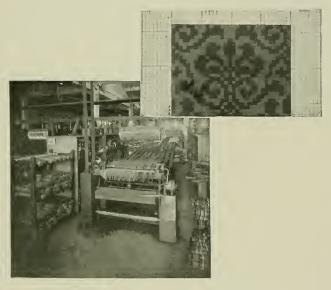
which supports the trap-boards."

Mr. Dornan's inventions, which were numerous, were mainly applied to his own machinery and were not offered to the general trade. He died in 1888. The Murkland loom is claimed by many to be the parent of ingrain power manufacture, and certainly was as far as Philadelphia is concerned. This loom led until the Crompton and Knowles looms became available in 1886-7, and stood without a peer here or abroad in the ingrain carpet industry. Murkland was a poor machinist of seemingly indifferent capacity. He exhibited his models in Hartford, Connecticut, and Lowell, Massachusetts, for some time before carpet men of means could be induced to take them up. The argument seemed to be that having the Bigelow loom, nothing else was needed. At this period (1868-70), Philadelphia was virgin soil for power machinery. In all the Kensington territory there was not a factory where successful power looms were in operation. All former experiments with power looms were in the junk heap. Meantime, the needs of the country were in-creasing at a tremendous pace and New England was getting the cream of the carpet trade. Fortunately, Murkland at last laid his plans before a Philadelphia manufacturer. The result was encouragement and help that led to orders for these looms from several concerns. E. S. Higgins & Co., of New York, and George Naylor, of Lowell, were among the first purchasers of this loom. The patents passed into the hands of Josiah Gates & Son of Lowell, and arrangements were made with a certain company to make the loom on royalty, and this concern has continued the manufacture ever since. What is claimed to be the first Murkland loom, built in 1869, stands in a Philadelphia mill where it is doing good work yet.

New England, with the aid of the Bigelow looms, was, up to the advent of the Murkland loom, the sole source of supply for fine carpets. Philadelphia, with its hand looms could produce an inferior grade only. With the Murkland, Philadelphia took a position in production practically on a par with New England and produced some beautiful fabrics, without the aid of highly skilled labor. By 1880, Philadelphia had more ingrain power looms than all the other cities combined. The Murkland loom, fully rigged with attachments, cost in those early days \$1000, placed in position, while a hand loom could

Boston. Some old time carpet men may remember Crompton's "Cotton Bocking" woven two yards wide with the figures printed upon it, which came out about 1840.

Unlike some of the other power looms mentioned, the Knowles ingrain power carpet loom was the product of pure native genius. Lucian J. Knowles, the inventor, was born in Hardwick, Massachuetts. Many inventions of his were perfected and patented before he set to work to produce the loom that made his name



(Upper) A Design on the Card. (Lower) Planning an Axminster

be placed in operation for about \$100, yet the additional production and greater value of the product made the greater expense unimportant. The Murkland loom did for Philadelphia what the Bigelow loom did for New England.

The Crompton ingrain loom was invented by George Crompton of Worcester, Massachusetts, and was brought out in 1886. Mr. Crompton inherited much of inventive genius from his father who came to this country from England in 1836 and afterwards introduced some valuable machinery for weaving fancy woolens under the patronage of Samuel Lawrence of

famous. The Knowles loom is used also in all carpet manufacturing centers. It is simple in construction, as compared with the Bigelow loom; easy of action, and can be run at a high rate of speed, a decided consideration today. The loom was brought out in the same year as the Crompton loom, 1886, and made in Worcester, Massachusetts.

The Crompton and Knowles looms produce very high grade fabrics, run ninety picks per minute and produce fifty yards of carpet per day. They are less expensive than the Murkland looms and also weigh less. Many were introduced in the

old Murkland plants, and practically all new carpet manufacturers adopted one or the other of these looms.

As a comparison of production, it required two weeks to make a piece of extra super ingrain on a hand loom. The cheaper grades of nine pair goods could be produced at the rate of one piece per week. The Murkland loom would yield thirty yards per day of extra super, and the Crompton and Knowles fifty yards per

day.

It is interesting to contrast the former method of procuring designs, the scarcity of them in the early days and the abundance today. In the first stages of the industry, manufacturers, the ingrain maker particularly, ran but few patterns. were simple in conception and few in colors, easily matched when made into a fabric by sewing. Nearly all our designs then originated in England, as was natural, because the industry originated there in its modern form and its artists were more capable. Often one popular pattern would be made by a majority of the leading American mills, as for instance, the old "Henry Clay" pattern which one of our manufacturers designed and christened in honor of that statesman who visited Philadelphia and inspected the mill. The retailer was partial to designs which matched up easily. If a carpet had eccentric floral work in which the breadths must all run the same way, it required special care in cutting and sometimes a heavy loss in making the figures hit. Patterns which would allow breadths to cut and turn around easily were popular in all American stores and remained so until the skill of the designer who produced pleasing effects, with variety in the design that would allow of cutting to little waste, came into evidence.

Some of the three-ply carpets made by the Hartford Carpet Co. have been in demand for nearly a hundred years, and similar facts are not wanting in Philadelphia. The "Fort Sumter" pattern of 1861, was in demand for nearly fifty years. Most of the early designs of all the carpet mills, it is pretty safe to say, were copies, pure and simple, of designs. But it was not long before this country took a leading part in original designs. By 1875, mills in this country were producing carpets from their own designs and securing patents on them, thereby making business for the courts on infringement cases, some of which were carried to the Supreme Court of the United States. As the laws then could show that no exemplary damages were sustained, an act of Congress was passed which had special reference to carpet productions though covering every class of textile designs. The result is that all the large carpet mills employ their own designers and are generous patrons of those who design as free lances. There is a standard of ethics in regard to copying the patterns of one's neighbor, which is even stronger today than the very law which sought to protect him. Copies are, of course, freely made of "period" designs of French, English and German art, while the beautiful Oriental weaves are utilized over and over again, with more or less modern variations.

For the raw material used in the manufacture of the greater number of carpets, we have to call upon other countries. The wool grown in the United States, is, as a rule, far too fine and soft for the purpose. Carpets require strong, tough, wear-resisting yarns made from wool grown on sheep of wild, mountainous and cold countries. When assembling the wools for carpet making, therefore, we select wools from China, Russia, Scotland, the Mediterranean States, Asia Minor and the Argentine. We get our linen stock from Italy, Belgium, Russia, and Great Britain, and jute from India. Cotton is a most important factor and our own Southern States produce this in abundance for us.

The dyes which give the real character to the patterns must not be overlooked. About ninety-five per cent of the dyes used came from Germany before the World War, but now there is a considerable proportion made in this country. Our chemists are forced and undoubtedly glad to give relief not only to the carpet industry but a vast number of others as well. How the proportions will be divided ten years from

now is a problem yet unsolved.

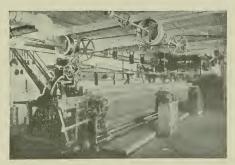
The yarns for carpet making are seldom made from the wool in its pure, native stock. A judicious mixture of different wools produces the best results. The great basis is China wool mixed with Scotch, Russian, South American or Georgian. Worsted yarns used in the highest grades of carpets and rugs are made by combing and recombing the wool until the short fibres are removed and only the best and longest remain. Italian hemp forms the bulk of the linen required, but flax makes a finer linen which is also liberally used. Jute is placed in the backs of the cheapest and some of the medium grades of floor coverings. This is grown in India, but

both the linen and jute used in carpets are now spun in this country.

Although, strictly speaking, spinning the yarn from the raw material, scouring, dyeing, spooling and beaming are not parts of the carpet manufacturers business, the largest manufacturers include one or more of these processes in their system. All are necessary, but there are concerns that make a business of these processes for the trade. The carpet mill that can do all does so with the personal satisfaction of knowing that every process is up to the standard set for his products, which can be sold with that knowledge and consequent guarantee.

In the finishing of the woven goods, steaming, shearing, and burling play important parts, particularly as applied to the pile fabrics like Wilton, Axminster and velvet. The steamer raises the pile which is distributed—by direct solicitation of the manufacturer, by selling agencies, through the jobber or middleman, and through the mail order houses.

The United States is, by force of circumstances, obliged to consume its own product in addition to several millions of dollars' worth of European and Oriental rugs and carpets imported each year. The necessity for buying abroad the great bulk of materials used, and the much higher wages paid in the United States for manufacture, make it impossible to compete with Great Britain, Germany, and France; consequently there is practically no exportation of floor coverings. The wonderful growth of the United States with its enormous consuming power has been sufficient warrant for the increased number of factories and additional looms in recent years.



Chenille Axminster Loom 30 Feet Long

may have been crushed, the shearing machine trims it to a uniform height and the women burlers remove and repair all the minor imperfections, such as knots, threads, etc., that are bound to creep in to a greater or lesser extent.

In the old days, the days when the hand loom was the limit of efficiency, the manufacturer would bundle a roll when completed, carry it to the nearest shop where such things were sold, and after considerable dickering dispose of it to the dealer, always "losing money on every roll"! The journeyman weaver was generally "boarded" and lodged by the proprietor. These small factories were in many cases the foundations for the big establishments that we know today, through which the sons or successors of the originators gained much wealth.

In modern times there are four principal ways in which the product of a carpet mill

There are two seasons in the year for the carpet manufacturer. He places on sale in the fall of the year the goods shipped to the retailer for his spring business which opens about March of the following year, and the goods shown in the early summer are for the fall season beginning about September.

The kinds of carpets made today and their difference in construction are described as follows:

BODY BRUSSELS AND WILTON

Brussels carpet gets its name from the place in which it originated, Brussels, Belgium. This fabric was not originally used for a carpet but was a tapestry for the wall, used as a decoration long before wall paper or other decorations of a more modern sort were thought of, but was their forerunner, and it was made with a ribbed surface. For use as a carpet it was first

made in England between 1740 and 1750. The Wilton effect was made in Flanders and France before it was made in Wilton, England, in the middle of the 18th century, but derived its name from the latter place. There is no difference in the manu-

shows on the surface to form the pattern, all the other colors are under it on the back, thus giving the fabric body or thickness and wearing quality, hence the name "body" Brussels. The Wilton is made heavier than the Brussels and is the best



Body Brussels

facture and quality of materials used in body Brussels and Wilton, but the looped surface of the Brussels is made by weaving the yarn over a round wire of which there are several ready in the loom. Body Brus-

domestic fabric for endurance. It looks darker and richer than the Brussels, even though of the same yarns and patterns, because the cut pile absorbs more light. A room with a high ceiling is better adapted



Wilton

sels was perhaps by far the most important kind of carpet for many years, but there has been for some time a growing preference for the Wilton. In weaving Wilton the wire used has a sharp, knife-edge at to a pile fabric than one with a low ceiling. Some double Wiltons are made, that is, the face or pile is woven thick between two backs, one on top and one on the bottom, and then the pile is cut; but the



Tapestry

one end which, when withdrawn, cuts the loops, making the pile or plush surface the only material difference in the two styles. Both use the Jacquard to form the patterns.

The important mechanical feature of these two grades is that where one color

production is limited, owing to the danger of uneven cutting and the spoiling of rugs, for which these are made. It cheapens the process somewhat and is a quicker method of production, two rugs being made at the same time, and only the additional time required for cutting apart. Brussels and

Wiltons use the Jacquard to form the pattern, which is described elsewhere.

TAPESTRY AND VELVET

Tapestry has a resemblance to the ancient wall tapestries in its somewhat misty, lack-of-precision effect and is capable of exceedingly artistic treatment, for there is no limit to the colors which may be used. Velvet carpet looks something like yelvet, hence its name. Tapestry car-

the dye and touches the threads, the color being elongated to allow for weaving over the wire. Each color is applied in turn in the same way.

After the threads are steamed and set the weaving is simple, for when the threads are woven the colors will come up exactly as in the design. Each thread is printed with all the colors and all the yarn is on the surface, none carried through the back as in the Brussels and Wilton. This



Velvet

pets have the ribbed or looped effect of the Brussels, while the velvet has the cut pile appearance of the Wilton, but the method of manufacture is entirely different from that of the Wilton.

Both the tapestry and velvet are printed fabrics and do not require the Jacquard mechanism. The colors are all printed upon the threads before weaving. The process is very delicate and requires the greatest accuracy in order to have the col-

method was invented in England in 1832 by Richard Whytock.

There are tapestries and velvets woven in one solid color and the figure then stamped in by great pressure of rollers on which the design has been cut, each color being on its own roller and each roller having cut in it only that portion of the design containing that particular color. The carpet is then dried on hot cylinders and the face is raised again by steaming. This



Axminster

ors appear in the right places when woven, but for all that there is not the accuracy that can be obtained with the Jacquard, and this gives the misty, soft effects. In making ready for tapestry and Wilton fabrics, the yarn is prepared for an entire print of possibly 3,000 yards and is placed upon a large drum. Each little section of color corresponding to the same section in the design is made by means of dye contained in a small vessel which runs upon a track under the drum, one color at a time being printed. A small wheel revolves in

process was invented in 1891 by James Dunlap of Philadelphia, Pa.

AXMINSTER

There are two styles of Axminster, the ordinary spool Axminster and Chenille Axminster. The process of production differs materially from that of Wilton and Brussels, or tapestry and velvet. The name is derived from the city in which they were first made, Axminster, England, about the middle of the eighteenth century.

In making the spool Axminster, the design is before the operator, who arranges one cross-shot with the colors side by side exactly as they are painted in the small squares in the design. The yarns are dyed in the skein and laid out on a long frame from which they are wound on a large spool the width of the fabric. Each spool is provided with a projecting frame containing small tubes through which the threads of yarn pass. The spools are placed in the proper rotation on an endless chain which carries them to the weaving point on the loom where the yarns

of manufacture is to some extent a hand process and requires two looms, one for the Chenille and one for the back; and, as the back is woven, the Chenille is bound to it by threads. Chenille is made on the first loom like a sheet of thick, flat cloth, with warps close together, running through, in fact, just the exact height of the pile apart, for the goods are cut into little strips and bent up on each side of the warps by steaming. The warps then form the back of the strips of Chenille, which is attached to the solid back, making the completed fabric. In this process the pat-



Chenille, Showing a Section Partly Cut Between the Warps

extending from the tubes are grasped by a row of nippers and drawn between the warps. These are then caught again on the lower ends by another series of mechanical fingers which bring them up under the filler which has been carried across the loom. The yarns are then cut at the tubes by a pair of knives working as automatic shears, leaving the small pieces which form the pile face of the carpet. Each spool is

tern can only be produced by human guidance. The weaver, formerly by hand, but through later inventions by pressing a key, sends the desired color crosswise through the many warps. There are as many shuttles containing yarns as there are colors in the design, each shuttle containing the color, and may be sent through a number of times in succession, or infrequently, according to the design. One large sheet of



Chenille, Bent up on the Warp, so that it May be Attached to the Back

brought into position in turn until the pattern is finished, when the procession of spools comes again.

Chenille Axminister is considered by many to be the floor fabric de luxe. In a good grade, its thick tufts of yarn, long pile and heavy back make it the rival of the Oriental in appearance and wear, and its cost is greater than that of the Wilton. It is sometimes called the Scotch Axminster, having first been successfully produced in Scotland, although patented in England in 1839.

Chenille is a row of tufts called "fur," bound on fine warp threads. The process

cloth produces many little strips of Chenille, each identical in color, for they represent one shot of weft exactly as one shot across is shown on the design.

After the Chenille is woven on the weft loom it is taken to the fur cutter, which consists of a steel cylinder with grooves cut into it. A set of very sharp, high-speed knives cuts the woolen yarn down the center between the warp threads. A strip is used as it is required in each repeat of the figure. The second shot across is planned in the same manner, then the third, and continued until every shot is made that is required to form the pattern. It is

readily seen that the whole cloth woven on the warps running down becomes the width when cut into strips. After being steamed the strips of Chenille are placed in a large shuttle with the succession of the cross-shots now properly arranged, and mechanically sent back and forth over the second or Chenille-setting loom. As this loom does not weave with absolute accuracy, the weaver must guide by hand the setting of the Chenille while being attached to the back. Chenille Axminster rugs can be made in different shapes with comparative ease, because of the method of weaving and the amount of hand work constantly necessary.

SMYRNA

For a long time the Smyrna was about the only grade which could be classed as a rug and the production grew to great

The name ingrain is derived from the fact that the plies are ingrained together. The colored yarns are placed in shuttles which are thrown back and forth across the loom through the warps, the Jacquard regulating the colors forming the The warp unites the two plies pattern. where there is no figure or where the figure changes. Where there is any amount of one color or combination of colors the two plies are separate and in wear, these places, called pockets, give out first, so it is usually desirable to have a design well knit up with frequent changes. At first only two colors were used, then four, with a limited application until the invention in 1885 by Harry Hardwick of Philadelphia of the "mate-thread" or Bromley weave. By this new method the same colors could be used in combinations not previously



Ingrain

proportions; but, like the ingrain, it is not as prominent as formerly in the realms of carpetdom. It is an imitation of the Smyrna or Turkish rugs, hence the name. Smyrna is a thick, Chenille, double-faced fabric made somewhat in the manner of Chenille Axminster, except that the small strips remain flat and strike out on both the face and back, making both sides identical.

INGRAIN

Ingrain is, or was until very recently, probably the best known carpet in this country, but has largely gone out of popularity, although in the aggregate a large yardage is annually made and sold. It is of Scotch origin, but in the early days was known as Kidderminster carpet. Ingrain is a soft, flat fabric, the same on both sides, except that the colors are reversed. It is mostly made in two-ply, although three-ply was formerly made in considerable quan-

possible. Later Mr. Hardwick invented the Agra weave in which the plies were bound together, avoiding all pockets. Ingrain carpet is almost invariably one yard wide, though, as we have stated elsewhere, other carpets are generally twenty-seven inches wide.

RAG CARPETS

Rag carpets are familiar to us all, and were originally woven by hand, and later on hand looms from the rags collected in the households of our forefathers. In late years the making of carpets and rugs in the style of those of our ancestors has been easily accomplished by machinery and the results, while carrying the effect well, are produced infinitely faster. These are woven in the simplest manner and the patterns usually "hit or miss," as the colors of the "rags" suggest, but on the rugs there is usually a different color effect at each end.

CHAPTER TEN

SPINNING THE YARNS. DEVELOPMENT OF THE PROCESS.

The great textile industries of the world are so dependent on the spinning of yarns, that the interest of one is inseparable from the other. Spinning is the forming of threads (yarns) by drawing out and twisting fibres of various kinds. There is ample evidence of the great antiquity and wide diffusion of the art of spinning, for spinning of some sort must antedate weaving and knitting whenever short fibrous materials have to be utilized. Wherever traces of even the most ancient forms of civilization have been found, the remains of either implements employed in spinning or spun threads have also been found. The simple spinning apparatus which was used in the early days continued to be used by civilized communities until comparatively recent times, and it may, therefore, be said that no art which has been so long and widely practised remained so unprogressive as that of spinning. On the other hand, since about the middle of the eighteenth century, when human ingenuity bent itself in earnest to improve the art, there have not been developed in the whole range of mechanical industries machines of greater variety, delicacy of action, and manifold productive capacity than those now used for spinning.

When primitive man had been making fabrics by plaiting and weaving grasses and reeds for some time, perhaps only a few thousand years, some early genius discovered that by twisting the long grasses a better textile could be produced and it was but a step to twisting fibrous vegetation so as to form a longer strand than the original fibre. Then, undoubtedly, came a long series of experiments with various vegetable fibres and animal wool or hair and the making of more or less continuous threads or yarns. The many and varied uses for these must have been at once apparent even to our benighted ancestors and there is evidence that progress was rapid for those

Just when mechanical assistance was first used cannot be determined, but one of the first thread-making implements of which evidence has been found consisted of a wooden spindle nine inches long which was rounded and tapered at both extremities.

Other spindles up to fifteen inches long have also been found. Near the top there was usually a notch in which the yarn was caught while undergoing the operation of twisting, and lower down a whorl or wharve, composed of a perforated disk of clay, stone, wood or other material, was secured to give momentum and steadiness to the rotating spindle. Long fibres were commonly attached to a distaff of wood, which was held under the left arm of the operator, but very short fibres were spun from carded rolls. After attaching some twisted fibres to the spindle a rotary motion was given to the latter by rolling it by hand against one thigh, or by twisting it between the fingers and thumb of the right hand, after which the fibres were drawn out in a more or less uniform strand by both hands and converted into varn. When the thread was of sufficient strength, the spindle was suspended by it until a full stretch had been drawn and twisted, after which that portion was wound upon the body of the spindle, and the operation continued until the spindle was filled. The quantity thus rolled gives the name to a now definite measure of linen yarn, namely "the spindle" or 14,400 yards.

Practically all of our knowledge of the earliest spinning comes from parts of the apparatus found and pictures showing a person performing the operations. There is very little in writing that exists concerning it. But the fragmentary drawings are clear enough to show the spindle in use and the results, and are conclusive.

Simple as was this primitive apparatus, a dexterous spinner could produce yarns of an eveness, strength and delicacy that compare well with those produced by elaborate modern appliances, as proved by fabrics that have come down to us from the earliest days. The yarns of certain gossamer-like muslins of India were so fine that one pound of cotton was said to have been spun into a thread nearly 253 miles long in the making of it, incredible as it sounds. The feat was accomplished with the aid of a bamboo spindle not much bigger than a darning needle, and which was lightly weighted with a pellet of clay. Since such a slender thread could not support even the

weight of so light a spindle, the apparatus was rotated upon a piece of hollowed shell.

The spindles as above described were, so far as is known, the sole apparatus with which yarns were spun until comparatively modern times.

The changes in modern spinning have had for their objects, three things: the providing of mechanical means to rotate the spindle, an automatic method of drawing out the fibres, and devices for working a large group of spindles together, and at

higher speed.

The first improvement consisted in cutting a ring grove in the wharve, mounting the spindle horizontally in a frame, and passing a band from a large wheel around the wharve. A rotating motion was then given to the spindle by turning the wheel with the left hand. After attaching the filaments to the spindle they were attenuated with the right hand, and when fully twisted, the thread was moved to form a right angle with the spindle and coiled upon it. Such a wheel has been long known in India, and from a drawing made in a fourteenth century manuscript in the British Museum, it appears to have been known at that time, though far from being in common use in Europe at that early date. It ultimately became known in England as the "bobbing wheel,"and was in constant use down to the beginning of the nineteenth century for spinning coarse and fine yarns. But fine yarns received two spinnings. The first consisted in drawing out and slightly twisting the fibres into what is still known as a roving. By a second spinning the roving was fully attenuated and twisted.

In 1533, a citizen of Brunswick is said to have cranked the axis of the large wheel and added a treadle, by which the spinner was enabled to rotate the spindle with one foot and have both hands free to manipulate the fibres. It seems impossible to accurately fix the dates at which all improvements in spinning were made. It is certain that many were known and used before they were generally adopted. Thus, the "flyer," which twists yarn before winding it upon the bobbin, is shown in a drawing by Leonardo da Vinci, together with a device for moving the bobbin up and down the spindle so as to effect an even distribution of the yarn. During the sixteenth century a machine of the foregoing type was widely used, and came to be known as the Saxonv wheel, previously mentioned in Chapter II of this book. This changed spinning from an intermittent to a continuous operation. The spindle had fixed upon its cuter end a wooden flyer, whose forked legs were far enough apart to enclose a double flanged spool, and at short intervals bent wires, known as the heck, were inserted in each leg for the purpose of guiding the thread evenly upon the spool. This spool was loosely threaded upon the spindle and one of its flanges was grooved to take a driving band from the large wheel, hence the spindle and the spool were separately driven, but the former at a higher speed than the latter. The twisted filaments were drawn through an eye in the flyer, led along one of its legs, and made fast to the spool. By operating the treadle the flyer twisted all the fibres about a common axis once for each revolution, and the spool wound up the length thus spun; the thread being slipped from tooth to tooth of the heck at regular intervals to direct it evenly across the spool.

During the seventeenth century a second and similar spindle and flyer were added, and these left the spinner free to manipulate one thread with her right hand and another with her left. It was in this condition that the most advanced form of yarnmaking was carried on until a great series of inventions revolutionized spinning and laid the foundations of the factory system

which now prevails.

The remaining part of the problem which lay before inventors was to draw out masses of parallel fibrous material, and twist them into uniform strands by mechan-

ical means.

The first stage in the evolution of mechanical spinning was effected by the invention of Lewis Paul of Birmingham, England, who obtained a patent in 1738 and was assisted by John Wyatt. The essential feature of this invention consisted in passing carded slivers between parallel rollers, each succeeding pair of which moved faster than the preceding pair, to attenuate the slivers to the required extent. From Paul's specifications it would appear that he attempted to turn the rollers about upon their horizontal and vertical axis simultaneously, in order to draw out the fibre and twist them in one operation. But he also mentions a plan for which he procured a patent some twenty years later, namely, the use of only one pair of rollers working in conjunction with a bobbin which drew off the thread faster than the rollers delivered the sliver, and coiled the thread about itself. The bobbin, therefore, attenuated, twisted and wound the material. Neither plan proved a commercial success. men of mechanical minds, among them Thomas Highs, of Leigh, labored upon the problem, but it was left to Richard Arkwright, a barber, of Preston and Bolton, to achieve that which his predecessors struggled for in vain. He obtained patents, in 1769 and 1775, for a machine which was subsequently known as the water-twist frame because water-power was applied to drive it. Arkwright's first machine did not contain any really new feature, for it consisted of Paul's drawing rollers, and the spindle, flyer and spool from the Saxony wheel, but the spindles and rollers were grouped in sets of four. Later the watertwist frame was changed into the "throstle" frame, which in turn, has almost ceased to be used.

In 1829, C. Danforth, an American spinner who was born in 1797 and died in 1876, year of our Centennial Exposition in Philadelphia, invented a "dead" spindle, on top of which he placed a hollow cap to serve as the winding point, and inside the cap he rotated a spool, a plan still used by worsted spinners. In 1828 another American, Thorp, invented a ring spinning frame, the principal feature of which consisted in the substitution for the flyer of a flanged annular ring, and a light C-shaped traveler. By means of the traveler, a thread was held in the best position for winding upon the spool, as well as put under the necessary tension. Later inventions have so altered the construction of the ring, traveler and spindle that a speed of upwards of 11,000 revolutions per minute can now be attained. This, of course represents a high development in continuous spinning.

While many efforts were being made to perfect continuous spinning, attention was also being directed to perfecting the intermittent process as represented by the bobbin wheel. In 1764, James Hargreaves, an illiterate artisan, of Stanhill, England, invented the spinning jenny, by the aid of which sixteen or more threads could be spun simultaneously by one person. All the spindles were placed vertically and rotated from a drum, but the rovings were mcunted in a movable carriage and passed between the jaws of a clamp that opened and shut like a parallel ruler. After securely clamping the roving and attaching them to the spindles, the carriage was drawn out slowly by one hand and the spindles revolved by the other. The rovings were then stretched to the proper degree of tenuity, and sufficiently twisted. This was followed by the inward run of the carriage, when the stretch of spun threads was wound upon the spindles and the operation repeated.

Hargreaves, therefore, as will be seen, returned to the first principles of spinning, namely simultaneous drawing and twisting. But although the jenny gave a greatly increased output, it was not well adapted to fine spinning. During the years 1774 to 1779, Samuel Crompton, of Bolton, combined in the "mule," the drawing rollers of Paul with the stretching of Hargreaves. But his rollers did not fully attenuate the roving before twisting them, as in the case with continuous spinning, nor stretching alone relied upon. This machine spun finer and more elastic threads than any of its rivals, but for a time the preparation of suitable rovings was a source of great trouble. The immediate consequence of the decision of the Court of King's Bench, in 1785, to throw open to the public Arkwright's preparatory machinery, was to enormously increase the usefulness of the mule. Since Crompton's time, a host of inventors have labored to render all parts of the mule entirely automatic; this has led to many changes and additions, but none of its essential features have been discarded. The inventions of Paul, Arkwright, Hargreaves and Crompton are the foundations of all modern systems of spinning,

As stated before, practically all modern textile industries are dependent on the preparation of the yarns, with the exception of plaiting and felting. The making of yarns began with the era of early civilization; it marked the first step in real thinking in early man and provided means for comfort, artistry and study. It broadened his scope intellectually and commercially; it was a power in the very development of civilization. From the time of the discovery that a group of fibres could be used, that a twisted group of fibres was stronger than straight fibres, that twisting a series of short fibres enabled the artisan to make a long thread, there opened up endless opportunity for development which modern man has taken full advantage of. It gives us cloth for innumerable purposes, and this with our modern homes are the real marks of civilization; it gives us our many styles of floor coverings; it is the real basis of modern comfort; therefore that early genius who first twisted vegetable or wool fibres should be honored today, and doubtless would be

if he (or she) were but known.

CHAPTER ELEVEN

KNIT GOODS AND THE VAST NUMBER OF MILLS MANUFACTURING THIS PRODUCT

Knitting as a commercial industry was brought to this country in 1698 by a colony of skilled handworkers from Hanover, Germany, who settled in Germantown, Pa., a Philadelphia suburb which is still an important center of knit goods manufacturing. It is now one of the most prosperous indus-

tries in the United States.

The art of knitting is one of the youngest of the textile industries. The story of the early days of knitting by machinery is a romantic one. Going back a quarter of a century or so previous to the beginning of the 300 year period which it is the purpose of this book to cover, we find that all knitting was hand work until the Reverend William Lee of Nottinghamshire, England, invented the first mechanical method of knitting in 1589, in the days of Queen Elizabeth. The minister's good wife was a famous mistress of the knitting needle and spent her spare time at this useful industry, to contribute to their joint support, for they were very poor. One evening her husband was watching her busy fingers fly, when it occurred to him that this work might be performed mechanically. He set to work and after considerable time, and the usual disappointments of the inventor, finally produced the forerunner of our present knitting machine. This machine or "mechanical stocking frame" produced a flat web which was afterwards sewed into shape.

In Lee's stocking frame, instead of one needle to hold the stationary loop while those of the row were being inserted, there were as many needles as there were to be loops in the breadth of the web, and these were so made as to form and give off the loops alternately. Each needle terminated in a hook or small indentation. The other end of the needle was fixed into a casting formed to fit into a frame and be securely fastened, side by side with the rest of the needles. Between the needles were placed thin plates called sinkers, in two rows. In one row the sinkers moved freely on an axis; in the other, they were all fixed to a bar and moved with it. The object of the loose ones, or jack sinkers was to make loops by pressing the thread down beneath the needles. The other row on the bar or lead sinker was brought down so as to press simultaneously on the hooks of the needles and press their points down into the little depression, so that they would pass through the loop without catching one way, and then take them up when opened and drawn in the contrary direction. The great ingenuity of the Rev. Mr. Lee's invention, especially at a time when mechanical processes of any kind were comparatively rare, lies in the arrangement for closing the hook in the needles so that one loop can be drawn through another.

This early inventor failed to profit much by his invention, as has been the case with many another genius, even though his device was destined to become one of the greatest factors in textile development. In the expectation of realizing a fortune, he ceased his activities as a clergyman, gave up his charge in Calverton that paid him at the rate of forty pounds per year, equal to about \$195 of our money normally, a fair remuneration for the clergy in those days in a country parish, determined to devote his time to perfecting his machine and manufacturing "knittewear." He figured that his own freehold or estates would enable him to meet the cost of necessary experiments to

perfect details.

With his brother James, who had helped him in the construction of the first machine, Lee took the frame to London in the hope of winning the patronage of the sovereign. Queen Elizabeth's Finsman, Lord Hudson, thought it was a marvelous invention and brought her to see it. She expressed her approval of its ingenious construction, but was disappointed because it made only a coarse woolen stocking instead of fine silk hose such as she was accustomed to wear. Lord Hudson begged her to give a patent for its use, but she refused. In order to please his Queen, Lee constructed a frame with twenty needles to the inch instead of the previous eight, on which he made a pair of silk stockings, (1598) which the Queen was gracious enough to accept and praise, but it ended there. No patent was granted, yet the machine was the forerunner of a business that by the middle of the eighteenth century had become an important feeder of

British commerce.

After the death of Queen Elizabeth, as he did not receive any encouragement from her successor, King James, or the English Court, Lee accepted an invitation from Sully, ambassador of Henry IV, King of France, to transfer himself and his invention to France. He settled in Rouen, with his brother and eight other operators. They had eight frames and "wrought there with great applause." But his expectations of a special patent were ended by the assassination of the French King, and Lee died a disappointed man in 1610. On the death of his brother William, James and six of the workmen with seven machines returned to London. The two other men with one machine continued to work at Rouen. Before long, the London Framework Knitters Company was formed for regulating wages and production, (an organization similar to our present trade bodies or labor organizations) and in 1657 was incorporated by Cromwell. By 1695 there were 1,500 machines actively engaged in the process of knitting in and near London.

The first stockings of cotton yarn were made in 1730. Previous to this they were all of woolen yarn, with the exception of a few of silk made on the one frame constructed for the purpose as noted above.

The first real improvement in Lee's machine was made in 1758, nearly two hundred years after the knitting frame had been invented. This was the addition of a second series of needles by Jedediah Strutt. With the use of these it became possible to produce ribbed fabrics, greatly increasing

the elasticity.

Small improvements were made from time to time, but it was not until 1816 that Sir Marc. I. Brunel invented a circular machine that made a tubular web. It was necessary to cut this web to the right length, slit it for the heel and knit in a pocket by hand, then draw the tip for the toe. This was stretched over the foot and leg and only by this stretching did it assume anything like a real shape. Later some genius discovered that this uncouth bag-like article could be given some better semblance of foot-form, by stretching over a board cut to shape and size and shrinking it thereon. This gave the people what looked like our modern hosiery, though for comfort it was yet far removed from the stocking of today.

Slow development has brought about a gradual improvement in knitting machines

until a complete, finished stocking can be knitted on a machine with so little attention from the operator that one can care for six machines working at one time. Shaping boards, however, still have to be used.

Knitting or loop formation by mechanical means is divided into two distinct principles -frame work knitting and warp knitting. Both principles may be employed in the formation of a large variety of plain and fancy stitches or a combination of the two. Frame-work knitting in its simplest form consists of rows of loops supporting each other, built from one continuous thread of varn and running from one side of the fabric to the other and back. It is on this principle of stitch that the greatest amount of hosiery is built. Warp knitting in its simplest form consists of rows of loops, but the number of threads employed is equal to the number of loops in the width of the fabric, and this is used largely in making

shawls, gloves and fancy hosiery.

As mentioned above, the German colony settled at Germantown, Pa. By 1775 that town and the vicinity of the Brandywine boasted 150 knitting frames, and in 1815 the number had become 200. These, in all probability, were employed principally They were apparently inin the homes. They were apparently in-corporated with the cloth and flannel making industries, which in the early years were an important part of the life of Germantown. Previous to the year 1818, the industry was encouraged in different parts of the young country. A committee of safety appropriated a bounty of \$300 in Maryland for the establishment of a stocking mill, and in New York a prize was offered to the first who should set up stocking frames of iron. Neither, however, was claimed. As in the cotton industry, England was fearful lest she be hurt commercially by success of the knitting industry elsewhere, and had penalized the exportation of stocking machines up to 1780, and after that increased the fine at different intervals, until eventually it became practically a prohibitory duty. In 1818, the exportation of lace machinery was punishable by a fine of 500 pounds or several years transportation. The Luddite riots deprived stocking knitters and lace weavers of their work and many of them came to the United States with the tools and implements in spite of heavy penalties.

Smuggled over from Liverpool, the first stocking machine brought to New England was set up in Watertown, Mass., at a spot near the present Ætna Mills, a woolen and worsted manufactory. It was discovered that part of the machine had in some way been overlooked, so that there was a delay before it was finally operated. After being used at Watertown for two years, its owners, Benjamin Fewkes and George Warner, took it to Ipswich, Mass., where a big knitting mill is located at the present time.

About this time the smaller parts of lace machines were also secretly brought to the United States by former employees in English factories. The framework and other parts which were not so easy to conceal were constructed in this country from drawings. In 1820 a mill was started at Watertown, but in 1824 the machines were transferred to lpswich, where they were operated by the Ipswich Lace Company. Competition began in 1828 when the New England Lace Company was established, continuing until 1832. Great Britain killed the lace industry in this country, however, by placing an excessive duty on thread and permitting free exportation of lace.

Back to the stocking frames came the lace makers, however, a large number to Germantown, some to Portsmouth, N. H., while still others, the more efficient ones, remained in Ipswich. The industry progressed so that in 1832 two new stocking frames, the first made in New England, and possibly in this country, were constructed for Mr. Fewkes. He started a stocking factory in a little shop in Ipswich. In the same town, George Warner, Samuel Hunt, Sr., and Charles Bamford, Sr., embarked in the same business, each having two machines.

Power was first applied to the knitting machine by Timothy Bayley of Albany, N. Y., in 1831 and one year later power knitting machines were put in operation in Cohoes, N. Y., a large knit goods center of the present day. In 1834, James and Sanford Peatfield, of Ipswich, operated a rotary warp machine. "The Newburyport Hose Manufacturing Company" is recorded as the only stocking factory in the United States in 1831.

The machinery used in power knitting is noteworthy. While the spindle is necessary in the preparation of yarn for either weaving or knitting, there is no comparison between the simplicity of looms, even such looms as are employed on the most elaborate fabrics, and the complexity of knitting machines. In weaving, only one loom is required to produce a particular fabric. The capacity of knitting mills can be made clear only by specifying, not the number of machines, since as many as five are often required in the production of a single garment. Furthermore, for many kinds of work the

knitting machines must be supplemented by sewing machines, perhaps one sewing machine to every three knitting machines.

Improvements in knitting machines are frequent and important, for the most part. It is not an unusual occurrence for a knitting mill to "scrap," or sell at a loss, machines that are but little worn and replace them with improved machinery in order to insure efficiency in the face of competition. fortunately, the patents on knitting machinery are in a complicated and much confused state, so much so that some manufacturers who have made improvements themselves, operate their new machines secretly, without taking out patents, in order to avoid infringement by competitors, and complications with already existing patents. Yet there have been something over 3,500 patents on knitting machines taken out in the United States. And in spite of this, the complicated modern knitting machine is dependent for its efficiency on the same essential principles originated by the Rev. William Lee over three hundred years ago.

W. C. Gist, of the United States, in 1858, secured an English patent for a circular machine. By this invention it was possible for the machine to be supplied by as many as eight feeders, or any number under that, while previously one feeder only had been used. The new machine enabled the operators to make striped work, up to sixteen colors at once. Hine, Mundella & Co., bought the patent right. Some change was introduced, which made a simpler structure and more economical operation.

Thomas Thompson claimed the honor of being the first to adopt the circular frame, so as to produce ribbed work, although an American inventor, Pepper, and an Englishman, Appleton by name, contested the honor. Thompson improved on Gist's machines by using the tumbler needle, invented by Townsend, instead of the ordinary needle.

An American knitting machine, which made a dozen hose at once, was imported into England in 1834 and used in Manchester. This machine did not contain any of the parts of Lee's invention, and with durable yarns made goods which closely resembled hand knit work. They were called "Wild" machines, presumably from the inventor's name.

The latch needle was first patented in France by one Jandeau, and a modification of it in the United States in 1863 by Hibbert. In the latch needle machine a hinged latch folds back on the needle, so that the hook may take up the thread, and then closes

down over the hook so that it may pass the loop through the preceding loop. The movement of the latch is regulated by the movement of the yarn as it passes through.

On account of their greater speed and capacity circular machines have largely superseded all others for circular work. In these machines a circular series of vertical parallel needles slide in groves in a cylinder and are raised and lowered successively by an external rotating cylinder that has on the inner side cams acting on the needles.

In 1909 the total number of knitting machines in the United States was 115,019, over ninety-six per cent of which were power machines and eighty-one per cent were circular and circular-hosiery machines. Of the total, fifteen per cent were springboard-needle machines and eighty-five per cent latch needle machines.

In 1849 there were forty-nine establishments engaged in the production of knit goods in the United States with an annual production amounting to \$1,928,102. 1859 the annual production had increased nearly 700 per cent, according to statistics, while in 1869 it had increased again sixtyone per cent; in 1879 there had been another increase of 128 per cent, and ten years later it is reported that the increase showed forty-three per cent, while the next ten years the increase showed forty-six per cent. Available figures indicate that from that time to 1919, the number of knitting machines in this country more than doubled again.

Knitting machines in operation in the United States at different periods was as follows: 1869, 5,625; 1889, 69,047; 1904,

88,374; 1909, 115,019.

In 1909 the amount of cotton yarn knit into various articles was valued at \$48,165,-749; woolen yarns, \$3,834,094; worsted, \$10,116,325; merino, \$2,667,051; silk. \$3,606,599, and of other material a total of about \$180,818.

The increase in the use of knit goods of all descriptions has been rapid. In the early days underwear was largely made of flannel and even now we frequently hear the term "flannel" applied to underwear of any description, as it has become a generic word.

Every season sees more articles of wearing apparel entered in the knit goods class in addition to underwear and hosiery, such as sweaters and cardigan jackets, gloves and mittens, hoods, scarfs, and mufflers. shawls, leggins and gaiters, wristlets, jerseys and jersey cloths, tights, bathing suits, astrachan fabrics and others, and more recently, ladies' suits and cloaks and men's

The amount of knit goods of all kinds that was produced during the war is beyond estimate, supplemented as the production of the mills was, even with every additional machine that could be secured, for our sisters, sweethearts and wives kept their fingers busy all the time they were not absolutely in demand for something else and fingers were also busy at the theatre, church and afternoon tea. This extra output will probably never be very closely estimated. The spinners of hand-knitting yarns can come nearer to figures than any others, and it is a fact that more than one manufacturer of hand knitting yarn was enabled to build new and large mills on the result of this tremendous market for his goods.

Although this country was perhaps the last of the first-class powers to begin the manufacture of knit goods on a commercial scale, it has developed the art and business to a greater extent than has been the case in any other country. It was adopted in the early days by men of keen discernment and business ability and has continued on as sound a basis as any industry in the country. Its growth has been due to far-sighted business acumen and hard-headed business principles. In no industry do we find more careful working out of problems, or a more careful conservation of force than among the knit goods manufacturers. Compared with many other industries, the number of employees, considering the volumes of output and its value, is small. There have been fewer labor problems to cause trouble of a serious nature than in most industries. The class of men prominent in this industry are among the commercial leaders of the country. While it is true, as previously noted, that knitting machines are frequently scrapped to make way for improved models, it has always been a step in economy and increased or improved production. For the man or woman desiring work in the textile field, there is no branch that offers more remuneration and easier, pleasanter work than in a knitting plant.

As great as has been the development in America during the last ten years, those who are in a position to predict, look for still greater development in the next decade. Hand knitting will never cease, but machine knitting is all-powerful and its

scope is daily widening.

CHAPTER TWELVE

THE TREMENDOUS GROWTH OF THE SILK INDUSTRY IN AMERICA. SERI-CULTURE AND THE MULBERRY TREE BOOM. MANUFACTURERS OF THE FABRICS AND THEIR METHODS.

With a chuckle of triumph, the American manufacturer can thank old England's lack of perspicuity when she hounded her American colonies into silk cultivation and production though at the same time she denied them the linen and wool manufacture necessary to their health and comforts. Her aim was competition with the French market. Her achievement, however, was the foundation of one of America's proudest textile industries. The colonies were far too interested in producing homespun for their actual needs to have bothered willingly with so exacting a trade. Silk was the only industry England encouraged in this country.

If the beginnings of cotton manufacture in America were tinged with romance those of silk were to a large degree also. The first facts recorded in regard to silk in the Western Hemisphere pertain to the exploration voyage of Cortez into Mexico in 1531. He brought silk worms and mulberry trees for use among the Aztecs, or rather to induce them to go into sericulture. Shortly after Cortez' visit it is recorded that silk was grown. spun, and woven successfully, so that it was shipped to Europe.

The real inception of the silk industry in the colonies took place when James I of England attempted to introduce the growing of silkworms and mulberry trees into Virginia in place of the raising of tobacco. The King had learned that Henry IV of France had planted mulberry trees in the gardens of the Tuileries and at the beginning of the seventeenth century had obtained eggs of the silk worm from Italy. He had also done what he could to encourage sericulture. James I in turn was not to be outdone by the French monarch and similarly tried to foster the industry in England. Some of the members of his court suggested that the colonies might be exploited for the production of raw silk for the use of the English mills. The attention of the King was brought to the experiments of Cortez fifty years before, which had resulted in a certain measure of success. King James intended to make his country, if possible, occupy a supreme place in the world trade in silk.

In 1619 the reigning ruler sent vessels bearing silk worms to the Virginia Colony. But the ships were wrecked and the prospective nucleus for cultivation of the worms and trees was lost. A few years later, however, it is evident that another consignment finally reached the shores of America because we hear that in 1623 a ukase was issued to the young colony that a fine of ten pounds would be imposed on any Virginia settler who refused to plant ten mulberry trees for every hundred acres owned by him. In 1657, a bounty was offered by the Colonial Assembly consisting of 10,000 pounds of tobacco to any planter who should export £200 worth of raw silk or cocoons in one year, 5,000 pounds of tobacco to any producer of 1,000 pounds of raw silk, or 4,000 pounds of tobacco to anyone who should produce silk and no The industry made other commodity. progress under compulsion and with inducements of bounties until the withdrawal of this encouragement in 1666. From that vear cultivation decreased steadily in Virginia. Although the bounty was offered again three years later it failed to revive the industry and sericulture was practically abandoned in that colony. It was found that much more money could be made in growing tobacco than in the production of

An interval of several years elapsed in which no silk was produced in the colonies. The failure in Virginia did not discourage the idea, however, and in fact other colonies eventually tried their hand at the new game and were even spurred on to do so by this failure. In the closing years of the seventeenth century French Huguenots, skilled in sericulture, made their homes in South Carolina and together with Sir Nicholas Johnson, of England, carried on the industry. The call from England for more raw material early in the eighteenth century added further incentive to the enthusiasm of the enterprise in South Carolina.

Bounties for planting of trees and production of silk offered by several legislatures also stimulated the colonies until 1712 saw the volume of silk exported rise to about

500 pounds annually.

To further the steady growth of the trade in this country after its quasi-successful inauguration, the government in 1732 allotted ground in Georgia for the planting of white mulberry trees and granted land to settlers agreeing to plant 100 trees for every ten acres of ground cleared. As a result of this, in 1735 Governor Oglethorpe was able to take to England personally eight pounds which afterwards was used in the making of a dress for Queen Caroline. England in 1749 removed the duties of silk imports from Georgia or Carolina. These favorable features of the industry

soon resulted in a greater output from the colonies and acted as a means to the end which England was striving for, namely, a foremost position among the countries engaged in the production of silk. This was shown by an improvement in the quality of colonial silks imported by her as well as the quantity, so much so, in fact, that in some cases large quantities of colonial silks commanded higher prices than the best grades of Italian silk. It was not long after the improvement in the growth and export condition of their industries that the colonies started to take an active part in the manufacture of silk. In 1750, a reeling establishment was founded in Savannah. This marks the first departure from production of the raw material alone. Soon after this, an Italian expert, attracted by the rapid growth which silk had enjoyed in this country, established a silk filature for the reeling, doubling, cleaning, and twisting of silk. The direct result of this was a more rapid increase in the activity of the industry than heretofore. It is stated by historians that the quantity of cocoons received at the filature was so great that by 1759 Georgia's export of raw silk alone amounted to more than 10,000 pounds. Its quality was of such a high grade that it commanded a price in the London market three shillings higher than any other silk in the world. This figure compares with that of 500 pounds annually for all the colonies in the year 1712. In the short span of about fifty years with conditions far from desirable, silk production from one colony alone amounted to more than ten times as much as that from all the other colonies in the previous period.

The peak of the industry in Georgia was reached, however, and by 1772 silk production in that colony had practically ceased. Cotton became king in the South, particularly after it was found that the newly invented gin required far less labor in removing the cotton from the seeds than

in reeling the silk.

The Connecticut General Assembly was watching the rapid rise which the silk industry was making in other colonies and wishing to take part in it, passed an act as early as 1734, encouraging silk raising. It was not until 1763, however, that Connecticut took an active part in the industry. In that year the legislature of the state, learning of the remarkable success which had been attained in silk cultivation in the South, endeavored to stimulate it by offering bounties for the growing of mulberry trees and the production of raw silk. In adjacent territory, the spread of the new field of endeavor was rapid. By the middle of the eighteenth century, Philadelphia had become an important center of domestic silk production. A set-back was caused soon after this by the Revolution. Bounties offered by the various legislatures served to keep production at a comparative height and by the end of the Revolution, Mansfield, Connecticut, had taken a place with Philadelphia as a seat of silk culture.

FIRST SILK MILL IN AMERICA

It was not long after the establishment of Mansfield in the industry that the northern section of the colonies began to take an active part in the manufacture of silk. Mansfield, for instance, in 1810, the first silk mill in America was established which had been preceded by the formation of a company in Connecticut, in 1785, for the culture of silk as well as its manufacture. About this time, although the colonies were becoming very proficient in the production of large quantities of silk they did not improve the quality. Markets were difficult to find and as a result it was necessary for a great portion to be sold in this country in order for it to be sold at all.

At this time, also, many families were actively engaged in the culture of silk, the average quantity produced annually by each household varying from five to fifty pounds. Connecticut and Pennsylvania occupied the foremost position in quantity and most of the other colonies were engaged to a certain extent in its production. The amount produced by each was in about the following order: New Jersev, New York, Delaware, Maryland, and Virginia. The output of the last mentioned five states was large enough to furnish silk for their personal consumption. In 1810, New London, Wyndham, and Tolland Counties, Connecticut, were producing \$28,053 worth of silk annually, and nearly as much more of waste silk.

For nearly the first half of the nineteenth century, in fact, sericulture in the United States experienced a big boom, based on the morus multicaulis tree. The cultivation of this mulberry tree seemed, indeed, to be at that time of greater importance in the minds of the people than the silk-worms themselves. The raising of the food for the worms gradually assumed large proportions until in 1825 Congress considered a resolution inquiring into the industry. In 1826, the Committee on Agriculture to which it had been referred made a favorable report. A further report was later issued by the government and this was followed by still more documents of information. It is stated that the first morus multicaulis tree in this country was planted in 1826 in Baltimore, Maryland. The reason why this tree was more desirable than others, was that it grew more quickly and also with larger leaves.

It did not take long for the fame of the new mulberry to reach distant points, so that soon there were not enough trees for the nurserymen to fill the frantic demands of customers with. In 1832, a bounty for the culture of mulberry trees was offered by the Connecticut Legislature, which also fixed the price of raw silk at fifty cents a pound. Interesting comparisons may be made with the present average price (January, 1922) of about eight dollars a pound and with the earliest known price that there is record of, which was fifteen dollars per pound. Similar legislation was soon after passed by the law makers of Maine, Massachusetts, New Jersey and Pennsylvania.

The Cheney Brothers of South Manchester, Conn., whose silks are now famous, interested themselves in sericulture and became a prominent factor in the industry, even in those early days. They first started the culture of silk about the year 1833. One hundred trees could be bought for four dollars in 1834, but in the early part of 1836, they commanded about thirty dollars per hundred. The mulberry tree madness was a wild orgy of speculation. In 1839 as high as two dollars apiece was paid and in some instances as much as five dollars. Silk culture magazines galore were published, full of news of the silkworm and mulberry trees and their cultivators. The

craze continued in spite of the fact that the panic of 1837 had cast its blight on other industries.

Although in January, 1839, extreme prices were paid for the trees, later that year the mulberry and silk interests suffered from the financial situation to a certain extent. Furthermore, it was found at a rather late date that the trees did not readily thrive in northern climates and Americans gave up sericulture for good except in sporadic cases in later years. The production of the raw material is also more or less domestic and laborious. It was found that it was far more economical to purchase the raw silk from Japan and China, and also Italy, than to try to cultivate it in this country. The natives of those countries work for so much less pay that the cost to the manufacturer is far less than it would be if the raw material were bought in the United States. It was thought that by the unrecompensed toil of the slaves and also by the services of the American Indians, the expense could be made lower, but the work was not congenial to them nor were they sufficiently skilful to perform the task successfully.

In 1840 whatever trees were on hand were liquidated for prices considerably below what they were originally intended to sell for and used for other purposes. some cases, they were even burned. The loss was tremendous. The industry received its final blow in 1844 when a disease killed practically all of the trees. In the early years the manufacture of silk was never successful but now that sericulture had failed, the Americans turned their attention once more and more seriously to making silk threads and fabrics. So thorough and valuable has been the aid of machinery through the years that have followed that the country may well be proud of its position in the industry.

EARLY VENTURES

Previous to this time all attempts to manufacture silk were practically unsuccessful. In the early days the silk was made into cloth by hand processes and what was produced was hardly of marketable quality. A few mills, however, did operate in the early part of the nineteenth century, but the volume of product was relatively inconsequential. One reason was that the machinery was in some instances not sufficiently perfected to accomplish the desired results. This was the case at a mill established at Mansfield, Connecticut, in 1810 by Rodney and Horatio Hanks. They

invented a machine for the manufacture of sewing silk and twist and used water for the motive power. The Messrs. Hanks operated three mills in all, the first one only twelve feet square, but this enterprise was given up in 1828. Five years after the Hanks' had started their plant a mill was constructed in Philadelphia by William H. Horstmann. He also designed his own machinery in 1838, including power looms. In fact he was the pioneer in weaving silk narrow fabrics by power loom in this country, and at the same time that the first power loom of Basel, Switzerland, was used. Mr. Horstmann had the honor of producing gold laces in this country before their manufacture was even attempted in Europe. He attained a certain measure of success in his work, and in 1824 used also a Jacquard loom which was imported by him. Practically all of Mr. Horstmann's product of passementerie competed successfully with similar articles made in France.

Another early mill was started in Baltimore in 1840 for the manufacture of silk and worsted vestings. About twenty Jacquard looms were employed. The incorporation in 1829 of The Mansfield Silk Company in Mansfield, Connecticut, in the midst of a silk producing section reminds one of the similar building of cotton mills in the South where the raw material is grown. This concern existed until 1844, passing through many vicissitudes. Although it eventually failed, those interested put forth earnest efforts to make their venture all that they hoped for. Conditions under which they made these endeavors, however, were not favorable. One important thing which they needed was capital. They also did not have the knowledge of business which they should have possessed and experimentation was costly They did produce successfully some goods, such as handkerchiefs and vests, but generally their endeavors in weaving were not rewarded with the desired results either as to fabric or profits.

An early established plant is that of Cheney Brothers, at South Manchester, Connecticut, the only one to take the raw silk and carry it through all the processes to the finished product. The Cheney Brothers incorporated in 1837. The original name was the Mount Nebo Silk Mills, which started early in 1838. The company operated the plant for a short time, but during the mulberry craze, they ceased running it to devote themselves to sericulture. After the crash, however, they resumed operations and have made a won-

derful success of their business. The large modern plant is a big factor in the preeminence of the United States in the silk industry.

PROMINENT SILK CENTERS

One of the leading silk centers in this country is Paterson, New Jersey, although Pennsylvania is most prominent as a silk manufacturing state. As early as 1838, Paterson was laying the foundation of its future prominence in silk manufacture. In that year the first silk mill was established by C. Colt, Jr., on the fourth floor of Samuel Colt's pistol factory, which was also at that time in its infancy. Four years later, John Ryle, a well-known pioneer of the American silk industry, built the first loom for weaving piece goods. To Ryle, largely at least, belongs the credit for the present standing of Paterson in the silk industry. He began his career in this field in 1840.

Philadelphia, which occupies a high place in the silk industry in this country, began its manufacturing in 1815. As far back as 1824, the Jacquard loom was used there and in 1838 power loom weaving had its commencement. Baltimore tried its hand in making silk ribbons from domestic silk, but was unsuccessful. In 1830 silk fringes, tassels, and braids were being manufactured in New York City. It can readily be determined by the wide divergence in operation throughout the northern section of the country that silk manufacturing was beginning to take the prominent place that it was predestined to occupy. Between 1827 and 1835, many silk manufacturing companies were started, the majority of which, however, had a short period of existence. Although many of them failed, some began a successful career which has continued to the present time. One of the present day companies which makes a wellknown brand of sewing silk, started in 1884 at Florence. Another establishment of the present day entered the field in 1818. Today it is among the largest producers of knit goods in the country.

IMPROVEMENT IN MANUFACTURE

When silk mills began to be built in larger numbers, improvements in the various phases of silk manufacture from the cocoon to the finished fabric followed thick and fast. A silk dyeing establishment was founded at Curleyville, Conn., marking the first entrance into that field by domestic interests. Two Englishmen improved on the rather meagre outfit at this establish-

ment. One of them by some really wonderful research work succeeded in gaining a considerable reputation for the use of new colors, especially for his permanent black, a dye which had been hard to secure, or rather prove successful up to the time of his entrance into the field.

Since sericulture on a large scale was given up in this country in 1840, several attempts have been made to revive silk production here, but none of them have been successful. When silk mills began to operate more extensively in the United States

they imported their raw material.

In 1860 no less than sixty-seven factories were in operation. The import trade maintained a steady growth, and domestic silk was no longer looked to for the supplying of the needs of the American mills. In 1861 the silk trade in California which had been struggling along for some time, died quickly when it was found the silk worms required great care, were subject to disease and that the winters in that state were just a little too rigorous for their successful production. In the late seventies an endeavor to produce silk in Kansas was made, but the drought of the eighties effectually put a quietus on this attempt. The Department of Agriculture at Washington, D. C., was intensely interested in the subject of silk production for if it was found that raw silk could be produced successfully here, a valuable adjunct to our commerce would be secured. In 1878, therefore, this Department tried to interest our farming people in the growing of worms, especially in the South, where it was felt the climate was more suitable for this purpose. Beginning with 1883, annual appropriations were made for the furtherance of the Department's desire.

A reeling institution was established in Washington. All cocoons grown found a ready buyer in the government. Under this stimulus, the industry revived in Kansas, California and Louisiana. In the nineties Utah also took a hand at it. Government interest slackened in 1890, and lagged until 1901 when another unsuccessful effort was made. This time it was thought by the government that southern negroes of the poorer classes could be employed in sericulture, but it had become fairly well established that as far as the government was concerned the project was unfavorable and nothing has been heard of it recently. Certain developments occurred after 1901 and also previous to that time which apparently preclude the possibility of this government's again becoming interested in the development of raw silk production.

COM. PERRY BENEFITS INDUSTRY

In 1854, Commodore Perry made one of his stopping ports at one of the sea-coast towns in Japan. By the treaties which he made possible then, our country was enabled to establish trading relations with Japan, which up to that time had held aloof from the rest of the world. From that year commenced the export of silk from Japan which has steadily grown in proportions until now figures are amazing. The fact that this country imports such a large proportion of raw silk from Japan is to a great extent due to the successful efforts of Commodore Perry in consummating cordial trading relations with a country which pre-viously had not been particularly friendly with foreign nations. The country from which the next largest amount is imported is China. Because of the large amounts of silk which the United States, and other countries as well, obtain from Japan and China, it has been possible to reduce the price of silk, ranging from nine to ten dollars a pound to a level of from three to four dollars, although since the recent war silk mounted considerably above the latter

Under present conditions, it hardly seems possible for the United States to compete in the production of raw silk against countries where cheap labor is obtainable. This is enough in itself to effectually discourage all attempts to produce raw silk, as can be proven by the situation existing in France where labor, although slightly lower than in our country is yet much higher than in those of the principal producers of raw silk, and the conditions of silk culture are not exactly encouraging. In fact, in recent years silk production in France has been standing still despite the supposedly stimulating influence of government bounties. Conditions in Italy are somewhat better and at present there is no likelihood of the industry's passing into oblivion there, although it is still a matter of doubt whether or not in the far future Italy will not also be a victim of the fate which it is meeting in

Not only in the importation of raw silk, but in floss and waste silk also, the United States occupies a predominant position compared with the rest of the world. Hartford, Connecticut, and Boston, Massachusetts, take a considerable proportion of the total volume. Both of these cities are comparatively near the great silk manufac-

turing centers of New England at New London, Winsted and South Manchester in Connecticut, and Pittsfield, Northampton, Holyoke, and Florence in Massachusetts. Besides Paterson, mentioned above, the hard coal region of Pennsylvania and middle section of New York State are silk manufacturing centers. This is explained by the fact that in these sections it has been found that outside of the occupation of the men in connection with the mining of coal, there would be very little that the women could occupy themselves with, if it were not for concentration of silk manufacturing. It is also fairly well understood that the cost of female labor in these sections is slightly lower than would be the case were the mills situated in regions where the competition of other industries is a reason for higher wages per capita.

With the possible exception of China, on which accurate information is not obtainable, the United States is now the leading silk manufacturing country. This development has been rapid, for even as recently as 1905 France manufactured more silk than the United States. Since that year, however, our country has commanded the leading position with the uncertain ex-

ception named above.

Our mills now consume more than twothirds of the world's output of raw silk, as a part of the nation's dress silk is far in the lead compared with other countries. More than one-half of this enormous quantity comes from Japan, one-fourth from China, nearly as much from Italy, and the remainder from France, India, and other small

producers.

The season 1919-1920 witnessed the highest figures in both value and production of raw material. The grand total was 61,040,000 pounds. Estimates are used in making up this total where accurate information is not obtainable. It excludes Tussah silk, under China, and includes only 34,222,000 pounds under Japan, which was sixty-five per cent of Japan's total, as Japan consumes thirty-five per cent of her production. The amount would be further increased by considerably more in China. Exportation from that country for 1919-1920 was over 17,000,000 pounds, and the domestic consumption in that country is estimated at fifty-five per cent of the produc-tion. The total of 61,040,000 for 1919-1920 compares with 46,467,500 pounds in 1920-1921; 56,307,000 pounds in 1918-1919; 59,007,000 in 1917-1918; 59,800,-000 in 1916-1917 and 53,088,000 in 1915-1916.

An idea of the growth which Japan has attained is easily obtainable. In connection with this production we are enabled to gain a two-fold knowledge of recent events. Japan made a remarkable advance, but this would not have been possible if there had not been a corresponding advance in the popularity of silk itself, together with an increase in manufacturing the raw material by the nation which was taking the major portion of that raw material. This has been proven, because of the amount which the United States has absorbed in steadily increasing quantities during recent times, or, to be accurate, since 1905, when this nation first assumed its present standing as an importer of raw material and as a producer of the finished goods. The total of imported silk from all producing countries in the last few years has been of a steadily increasing nature, except that in the season 1920-1921 the crop was much smaller and purchases were also less on account of the business depression.

Prices on the various grades have also been increasing during the last few years, in the year 1919 touching the highest mark in history. During the major portion of 1920, however, prices receded to levels more comparable to their inherent worth. Financial reverses forced the silk merchants of the country to liquidate heavily, with, in many cases, severe losses. Many firms of long established standing, in fact, were forced to relinquish their activity in the

silk business.

A good understanding of the tremendous growth in importance, as well as in value, the silk industry has had in our national wealth can be gained by a comparison of the present situation with that of previous years. The degree of rapidity in the growth of the silk trade each year in importance and value to this country can be estimated by any one. In 1860, as previously noted in this chapter, sixty-seven establishments were in operation, a very good showing for the comparatively short length of life which silk had enjoyed at that time in this country. A few years later this number had increased to 139, but fell off to eighty-six by the year 1869. A big step forward was shown during the next few years and in 1879 it is recorded that there were 382 establishments operating here at that time. From then until 1914, when 902 mills were engaged in the production of silk goods, the increase in number and size was steady. Since that year the increase has been steady, so that in 1921

there were approximately 2,000 mills in operation.

At the same time the value of the products in 1850 was placed at only \$1,809, 476. The 1914 statistics show the wonderful increase noted in value. The figure for 1914 is placed at a new high level of \$254,011,257. The imports of raw material into this country and their value have been noted above. The figures pertaining to this date have been recorded year after year by steadily increasing numerals. In 1830, the first year for which records are available, imports into the United States amounted to \$7,918,534. Twenty years afterward, in 1850, imports had swelled to \$17,639,624. The imports for 1914 amounted to \$35,454,786 and five years later the figures show a rapid and large advance to \$54,700,816.

Perhaps the best comprehension of the rapidity of growth in value and scope of the American silk industry can be gathered from a study of the records of the years 1899 to 1919. Not only has this growth been much larger than for any previous period of like duration but during this time the government has apparently come to a realization of the extent to which it is indebted for a large part of its prosperity to the trade. In 1899, the total value of raw material imported, including raw, spun, and waste silk, amounted to \$44,759,354. In 1919 or twenty years later the value of the imports of these raw materials was placed at \$341,400,140 representing a gain of over 66? per cent. The percentage of increase in the cost of labor, wages and salaries during the same period has been approximately the same. In 1899 the cost of labor amounted to \$24,116,546, and for the year 1919 it amounted, it is estimated, to \$174,680,000 or an increase of 620 per cent. Overhead, other costs, and materials in 1899 other costs, and materials in 1899 amounted to \$48,685,069. Twenty years later an advance of about 470 per cent or a figure for the year of \$277,900,000 is noted. The total value of the production twenty years ago amounted to \$107,256, 258 and an estimate for 1919 gives the figure of \$793,980,140, representing an increase of more than 640 per cent in the short space of twenty years.

Wage earners employed in 1899 were numbered at 65,416. This number was of course over-shadowed by the parties so engaged in 1919 although the increase in percentage did not compare with the increase noted in other data here given, probbably due to the fact that improvements in

machinery were constantly being secured with the consequent displacement of manpower required. However, there is an increase in the twenty years period to an estimate of 142,444, or 117 per cent.

In view of the comparatively short life of silk in this county, its record of appreciation has been remarkable. This has been particularly true in the last twenty years or so, and it does not seem unreasonable to predict that in the next twenty years or more it is probable that this unbeaten record will be surpassed, providing the same conditions under which the industry has been operating in the past are continued or made better. This depends largely on our legislators. No fanciful theory should lead them to have enacted any law which would in the end not only injure the trade itself but react on the government as well.

For the reason that silk forms the most durable, most beautiful, and in some respects the most desirable fabric in the world, of course there are many imitations. This phase of the industry has had many evils connected with it in the past and many of the manufacturers have devoted time and energy to eradicating abuses in connection with legitimate endeavor in near silk. It is not strange that this should be the case, but that does not mean that steps should not be taken to do away with something in the trade that is hurtful to others who are honestly carrying on operations and do not hesitate to proclaim just what

they are doing.

The Federal Trade Commission has been devising ways and means through researching efforts in order to establish the silk industry on a better plane. Many of the leading producers of the finished product in this country feel that some protection should be given them against the importation of foreign-made products. These are not in any manner superior in workmanship and in many cases the reverse is the truth. But in practically all instances the cheapness of labor in the countries mentioned previously in this connection enables the exporters to offer their goods at much lower figures than is possible for the American manufacturer because of the high value labor here places on its efforts and the constantly mounting costs of over-head expenses. There is a great amount of logic in their desire and in view of the great improvement in the industry and the welcome addition it has made to the country's prosperity, it is reasonable that a certain amount of protection is due these men who have invested their capital in the business.

CHAPTER THIRTEEN

THE DEVELOPMENT OF THE DOMESTIC DYESTUFFS INDUSTRY

In very few industries have such radical or rapid changes in conditions taken place as in the production of artificial dyestuffs and co-related chemicals in the United States. There are many reasons why these changes have occurred, though perhaps the fundamental weakness due to a missing link at a time of need has been more responsible for an awakening in connection with the production of necessary chemicals than any other one feature. To what extent the domestic industry may be increased or decreased by general changes which can occur is not apparent, but the period of changes is probably far from over. In order to under-stand more clearly what the condition of the domestic dyestuffs industry was, it will be necessary to mention certain facts in regard to its development in foreign countries, particularly in Germany. There are very good reasons why it should have been very well suited to development in the country mentioned, since much painstaking effort was made in solving chemical problems, and many well trained chemists were available at relatively low wages. Possibly the expansion was due less to Germany's effort when dyes were first developed than to the lack of effort or co-operation on the problem in other countries.

For instance, when Perkin discovered mauve in 1856, it was the result of his oxidizing aniline oil and he obtained a tarry composition instead of clean crystals which he expected. Then when he attempted to wash this substance out with alcohol, he was surprised to observe a beautiful purple solution. When the same experiment was repeated with a pure aniline oil, he ascertained that the color could not be obtained. The reason why the color developed was because the chemicals were impure and the analine contained a small amount of toluidine.

This was the first step in the development of artificial dyestuffs, although naturally a certain length of time elapsed before any great amount of progress was made in the development of the colors or shades which are in use today. Even the fact that Perkin, who was an Englishman, developed the first artificial dyestuff was not sufficient to cause any permanent advantage to the country of which he was a citizen. Organizations were developed for the purpose of commercializing the ideas, but they never were very successful, possibly as stated, because the interest was in other directions rather than

in chemistry.

It will thus be observed that with the keen interest noted in Germany, a very great opportunity was afforded for the development of the idea and when once organized, progress was relatively rapid. It must be noted at this point that one of the great advantages to German dyestuffs concerns was the fact that they were in the field early and the larger they became and the more dyes they developed and the more co-ordinated the industry was, the stronger it became with less and less possibility of any other country competing successfully. This became especially apparent when to the production of dyestuffs was added that of many other chemicals of a medicinal character or which could be used for very many purposes.

Much of the strength in the dyestuffs industry has resulted from the co-ordination of effort and the development of by-products which would make unnecessary the throwing away of any valuable residue. With the expansion of the dyestuffs industry, both the location of the plants and the development of products from the chemical substances obtained has been of great importance. Ability to ship chemicals or intermediates from one plant to another at a low cost in order to balance production has undoubtedly resulted in low cost and improved products. Large profits have permitted consistent investigation and also the reinvestment of capital so that very small quantities of any waste material would result, thus tending to add to the large profits previously obtained.

Not a little of the importance of this industry has been the result of prestige or pride on the part of those interested. Every effort was put forth in Germany to make the chemical industry much more important than in any other country and the protection afforded by various methods permitted better results in quality of products and in other directions than could have been obtained by any other method. It must be realized that very few countries were af-

forded the opportunity to go into the manufacture of dyestuffs, first because very few of them were at all important in textiles, and had neither the facilities nor the training to warrant such efforts. The cost through the large over-head based on small production or the wasteage through by-products would have been sufficiently large to have prevented any attempt of this kind. Furthermore, inasmuch as in the past a great many manufacturers throughout the world have been more interested in making textiles at a low price than they have been in connection with the development of a dyestuffs industry, it was considered much more desirable to buy whatever dyestuffs were needed than to expend any large amount for their production, with no certainty that a return would be obtained and at the same time with practical assurance that the variety would be limited, and the quality not all that could be desired.

The foregoing indicates to some extent at least, why Germany's strength was so great and why it tended to increase. The production was for the world's needs rather than for home distribution entirely and this permitted greater variety, lower costs, and at the same time prevented any great amount of competition, particularly since the organization of the industry was such as to prevent the development of industries in other countries and kill them off if necessary by underselling.

In this connection, it may be well to indicate to what extent Germany controlled the artificial dyestuffs industry previous to the war. The figures given indicate that the average yearly production of Germany about 1912 had a value of about \$68,300,000; Switzerland, \$6,450,000; Great Britain, \$6,000,000; France, \$5,000,000; United States, \$3,000,000; Austria, \$1,500,000; Russia, \$1,000,000; and Belgium, \$500,-000, with approximately \$500,000 value in other countries. It will thus be apparent that of the total amount Germany furnished approximately seventy-five per cent or threequarters of the world's artificial dyestuffs. The exports in 1912 from Germany were \$48,430,000, or about eighty-eight per cent of the total amount; from Switzerland, about \$5,500,000 or not quite ten per cent. Great Britain supplied somewhat less than \$1,000, 000 worth. At the start of the war Switzerland was the only competitor of Germany, although a relatively small competitor. The explanation of this is that the Swiss industry was located in one center and due to the fact that there was little competition, and also to the fact that the production of certain dyestuffs was comparatively cheap and the ease of obtaining intermediates from Germany comparatively great. The Swiss industry was capable of continuing without suffering severely in the competition.

The largest purchasers of the dyestuffs exported were as follows: Great Britain, aniline dyes, 17.14 per cent; alizarin, 24.34 per cent; anthracene dyes, 23.72 per cent; indigo, 3.54 per cent. Austria, aniline dyes, 8.99 per cent; alizarin, 3.38 per cent; anthracene dyes, 6.80 per cent; indigo, 4.08 per cent. Belgium, aniline dyes, 3.90 per cent; anthracene dyes, 1.96 per cent; and indigo, .94 per cent; Japan aniline dyes, 5.45 per cent; anthracene dyes, 1.63 per cent; indigo, 2.46 per cent. China, aniline dyes, 13.17 per cent; indigo, 64.3 per cent; British India, aniline dyes, 5.35 per cent; British India, aniline dyes, 5.35 per cent; alizarin, 39.89 per cent; anthracene dyes, 4.44 per cent; indigo, .97 per cent. United States, aniline dyes, 21.59 per cent; alizarin, 8.03 per cent; anthracene dyes 44.10 per cent; indigo, 10.38 per cent.

It will thus be observed how large a purchaser the United States was of the artificial dyestuffs which were available for export, largely from Germany, but to some extent from Switzerland, Great Britain and certain other places. Dyestuffs are now admitted to form a much more important link in various industries, at least under normal conditions. than was ever considered the case in the It might be assumed that no large domestic dyestuffs industry was a necessity, but merely the standpoint that one of the products required must be obtained from some other source is sufficient to warrant consideration of a large American manufacture or a working condition which will permit of a satisfactory situation for domestic producers.

It may be pointed out that other countries depend upon the United States in connection with their supply of raw material, as cotton, silk, and wool, or in connection with fertilizer or other necessary material in other countries, but a self-contained industry is admitted if required more than in the past, partly due to the possible dislocation of ordinary business, but more to the uncertainty of general conditions and inability to eliminate the possibility of warfare, either in one section of the world or perhaps in a number of sections.

Even though the United States did not enter the war until rather late in the conflict, it was a very serious problem for domestic cloth manufacturers to obtain a sufficient supply of the variety of dyes which they required or to obtain them at what might be considered a reasonable price. This is one of the reasons why many textile manufacturers, instead of demanding an open market as they have at times in the past, are now willing to co-operate to a greater extent with the domestic dyestuffs producers and to permit that protection, which they themselves have always considered more or less necessary.

In addition to the foregoing and undoubtedly of very much greater importance is the fact that the dyestuffs industry and the explosives industry are very closely related. It was in this direction that a great amount of Germany's strength lay and it is on the basis of self-protection that many now desire a sufficiently large chemical or dyestuffs industry to assure a reasonable protection at a time of uncertainty even though this condition requires the payment of relatively higher prices for dyestuffs than would otherwise be necessary. It was largely because of the lack of dyestuffs-producing facilities that the development of the manufacture of explosives was so decidedly handicapped, at least for a time, although naturally, because the number of products was decidedly smaller and the lack of necessity for low costs smaller; it was much easier to develop the making of explosives than it possibly could be that of dyestuffs. It would be much easier to change from dyestuffs to explosives than from explosives to dyestuffs, in fact, the production of explosives would in no way indicate that dyestuffs could be made, except that certain other chemicals which might be of value or necessary for the manufacture of dyestuffs would be available through such production.

The danger of being unprepared is quite apparent and since it is admitted that in any future wars chemicals will play an even greater part in the conflict than they did in the past war, it is certain that some provision at least must be made for the protection or development of this industry. Since at the present time the change from dyestuffs to explosives is relatively easy and since trained chemists are a necessity under the conditions, it would seem that the only available method would be to develop a sufficiently large dyestuffs industry. The industrial production of chemicals is now considered of just as great importance as the ability to make the actual machinery of war and perhaps it is much easier to develop that machinery than it is to furnish the needed chemicals, and accordingly it would seem necessary to view this production from the angle mentioned rather than from the viewpoint which was adopted some years ago.

EARLY DEVELOPMENTS

Inasmuch as the expansion of the textile industry in the United States has been relatively rapid, due, first, to the actual increase in population and, second, to the relatively large increase in buying power of consumers, as the yardage of fabrics desired by domestic consumers is greater than in other countries, thus making more goods necessary, and because a great amount of effort and much capital has been required for the development of the textile industry, there has been less capital available for what might be considered less necessary details of pro-There appears to be much less duction. excuse for lack of dyestuffs production in the United States than in Great Britain or France for instance, because the industry, in the last two mentioned countries, was established earlier and there has been more opportunity for the development of other industries.

Dyestuffs are used for a relatively large number of products, but the most important are textiles, such as wool, cotton, and silk fabrics, for paints and pigments, for inks, varnishes, various leather articles, feathers, paper, etc., etc. It is only natural that a great many other industries are more or less dependent either upon the articles mentioned or the industries referred to. Some of these are the printing trades, carriage and automobile manufacturing, the paper trade, upholstery, dressmaking, millinery, soap, and other products. It will be observed that the necessity for colors is largely fundamental with some industries, that is, without the necessary dvestuffs these industries would be either largely or entirely handicapped and certainly the ability to sell much of the merchandise in which dyes are used would be decidedly reduced. Thus a large portion of the attractiveness of textiles would be eliminated were it not for the variety of their shades. Undoubtedly a large portion of the increase in the sale of textiles has been due to the very large use of the best dyestuffs by domestic manufacturers, since otherwise the fabrics would have been less desirable for the purposes for which they have been used.

In addition to the industries mentioned, might be stated that either the dyestuffs, the by-products, or certain of the chemical combinations are used for medicinal purposes, photography, perfumes, explosives, coloring materials in drinks, candies, etc., etc.

There are three particular classifications of the various dyestuffs. These are the natural organic dyes, the artificial organic dyes and the mineral dyes. Until shortly after

Perkin discovered the first artificial dyestuff, the dyeing trades, or the industries which use dyes had available only the natural and the mineral dyestuffs. As soon as possible after the artificial dyestuffs were discovered, they were produced for general use and they were so satisfactory that they displaced rather rapidly many of the dyestuffs previously used. Of course, many of these artificial dyestuffs were so pure, so regular in character, and either so much faster to light, to washing, or in some other characteristic, or the variety of shades available were so great that the older materials were rapidly eliminated. Because of this desirability, variety, low cost in some cases or other reasons in other instances, very few of the old dyes have been used and the quantities have been decreasing. Of course, early in the war, and due to the lack of the artificial dyestuffs which had been available previously, there was some increase in the use of certain natural dyes previously used, but this increase could be considered of a temportry character only.

The natural organic dyestuffs might be subdivided into four classifications, namely: indigo, logwood, red dyes, and yellow dyes. The following table, giving the quantities of these natural dyestuffs imported into the United States for the year ending June 30, 1913, shows what their importance is:

Annato	405,024 lbs.	\$ 19,991	value
Cochineal	109,089 lbs.	44,249	value
Cudbear	27,971 lbs.	1,755	value
Different dyewoods	155 tons	1,794	value
Fustic	3.785 tons	53,303	value
Natural indigo	231,834 lbs	88,716	value
Logwood	36,952 tons	475,484	value
Logwood and other wood			
extracts	2,258,206 lbs.	111.575	value
Ground madder	30,602 lbs.	2,803	value
Extract madder	2,154 lbs.	233	value
Orchil		27.386	value
Persian berry extract	64.833 lbs	7,173	value
Safflower, saffron		93.146	value
Turmeric		33,735	value

From the foregoing it will be noted that the total value of the importations of natural dyestuffs for the year stated was somewhat less than \$1,000,000. The indigo importations were undoubtedly the result of the past when natural indigo was the only available substance for producing the indigo color. It was obtained chiefly from India, though it was gradually being displaced by the artificial product. At the time mentioned, the natural indigo formed about seven per cent of the total indigo used. Logwood of course, has been, next to indigo, during the period when natural dyes were used, the most important natural dyestuff available, and was employed generally for the production of black shades on all classes of fabrics, just as indigo was used largely for the production of blue shades. It is the only natural dyestuff, with the exception of indigo, employed at all extensively in the textile trade and while the use is decidedly limited for fabrics made of cotton or wool, it is employed in rather large quantities in the silk trade. It is also used for the dyeing of leather and extensively in combination with other dyes to obtain certain shades.

In connection with the red dyes, can be mentioned Brazil, peach, Japan, and Lima woods, also barwood, camwood, and saunderswood Madder, which was a red dye and used for a long period to produce Turkey red has been eliminated by the production of alizarin. Cochineal, cudbear, orchil, annato, and safflower are included under the classification mentioned. Among the vellow dyes is fustic, which is perhaps the most important and was formerly used for yellow and olive shades and was used especially for woolen fabrics. Others are quercitron, Persian berries, and turmeric cutch. Certain of these became of more importance when artificial dves were not available.

It must be emphasized that the displacement of certain of the natural dyes was not due so much to the high costs of production as to t'e fact that in practically all instances they contained many impurities which naturally varied, depending upon their source of origin, and for this reason the substitution of the artificial products tended to produce more regular and much more satisfactory dyed fabric results. In other words, the substitution of artificial dye products brought the coloring of the various materials down to a more exact science where the results could be obtained more regularly and where fewer losses would be noted from unsatisfactory results. The mineral dyes were at one time of relatively large importance but they are now out of date and are used in relatively small quantities. The list of the most important mineral dyes composes chrome, yellow and orange, iron buff, iron gray, chrome green, manganese brown, and Prussian blue. Relatively large production of the necessary mineral dyes was noted in the United States when they were desired, but due to the changes which have occurred, certain ones of the mineral dyes required have been imported.

The interesting portion of the domestic dyestuffs development has all occurred since artificial dyestuffs have been produced. It is natural that the domestic industry goes back only to that time when a domestic plant was established for the production of artificial dyestuffs. This was in 1879, or just about the time when the greatest progress was being made in the discovery of new

dyes, since the period from 1880 to 1890, stimulated by the increase in production of fabrics, was perhaps the period when the greatest increase in the discovery of artificial dyestuffs occurred.

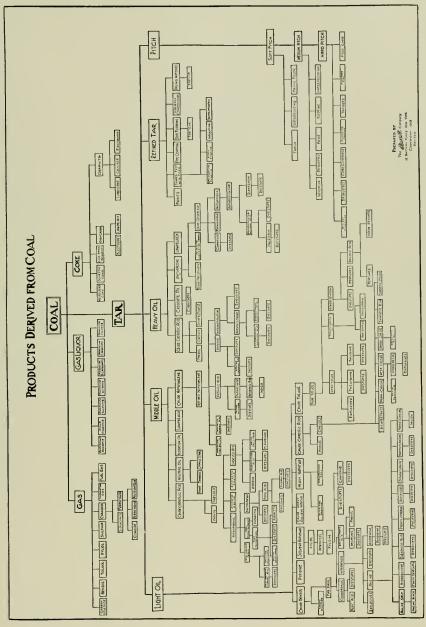
The first firm was established at Buffalo and has been in operation ever since organization. Certain of those dyestuffs now used regularly were developed by this organization and under rather difficult operating conditions it has been able to keep in production and, perhaps, was largely responsible for relieving the scarcity which developed because of inability to obtain the necessary dyestuffs from sources previously referred to. The firm mentioned produced approximately one-half of the domestic artificial dyestuffs, and previous to the war a total of approximately 105 dyestuffs. There were seven different plants producing dyes, though with the exception of the concern mentioned, the number of colors produced was relatively small and this was also true more or less for most of the dyes. The total value of the dyes produced during 1914 has been given as \$2,470,096. The number of persons engaged in the manufacture of dyes was 528, salaried employees, 130, and capital invested \$3,386,212.

Of course many more dyes are being produced as the result of the war demand. There has been a very large increase in the amount of capital invested, and the outlook is decidedly different from that previous to the war. It is, therefore, possible to divide the periods of production by stating that up to the time when the shortage developed as a result of the European war, the domestic industry was rather small, its production of dyestuffs was limited, and there was comparatively little inducement for any large expansion in production.

It may be well to explain why it was possible to keep in operation a domestic industry, even though the conditions noted in Germany tended to eliminate competition. In the first place, the importation of intermediates was free, while the importation of finished dyes carried a rate of duty of thirty per cent. The idea is that if certain intermediate products be imported, which are available in quite large quantities at a relatively low price, there can be produced certain finished dyes on which the cost of completing the process is not very great, that is, the margin of thirty per cent protection between intermediate and finished product was sufficient to warrant the production of certain dyestuffs and undoubtedly this opportunity made possible the production of other dyestuffs and also made possible a dyestuffs industry, whereas without the margin mentioned one would have been impossible.

Assuming that the domestic production was approximately \$2,500,000, there was imported about \$12,000,000 in value of foreign made dyes. Of course the value of these dyestuffs was increased more or less radically by the time they reached the mill or other consumer, but within reason a wholesale value of about \$15,000,000 would indicate the amount of dyestuffs consumed in the United States. This, of course, is outside of those natural dyestuffs which have already been referred to and on which the value was shown to have been much less than \$1,000,000. It will therefore be apparent that sixteen or seventeen per cent of the artificial dyestuffs used in the United States was made by domestic producers with the remainder imported.

To assume that the domestic industry represented this relation to the dyestuffs consumed would be unfair, since many of the dyes made in domestic plants were those used in greatest amounts and which could be produced at low prices, while the investment required to produce those dyes which were used in small quantities but which were just as necessary in order to make a balanced product, was very much greater than the percentages might indicate. Thus for the twenty-two German establishments interested in the production of coal tar colors, the capitalization in 1913 was only \$36,-700,000, but the profits had been so large that it is estimated the investment in these concerns at the time referred to amounted to at least approximately \$400,000,000. It will thus be apparent that while the capitalization was only about ten times as great as for the domestic industry, that actually the investment was nearly 100 times as great and perhaps the relation mentioned would not be so far out of line as it might appear to be on the basis of the figures given for importation. The value of the German dyes was considered to be approximately \$68,-000,000 previous to the war, which might seem reasonable when it is considered that the investment in the domestic industry was limited by the ability to obtain the intermediates and only those dyes which could be made easily appeared at all feasible. In connection with the development of the domestic industry, it may be well to indicate what the basis is for the production, to what extent it involves the production of other materials, and to what extent the domestic industry is limited, or what opportunities there may be for further expansion.



BASIS FOR PRODUCTION

The supply of raw materials for the production of artificial dyestuffs is obtained from two sources. The first is from gas works and the second coke plants. For various reasons, a great portion of the production of the coal tar was considered a waste product in the United States. According to census figures, the amount of coal used in domestic gas production amounted to 4,494,000 tons in 1909. For the same year, the amount of gas-oil consumed was approximately 580,000,000 gallons. The tar which was collected was given as 92,-153,000 gallons, although only 78,340,000 gallons appear to have been disposed of in the market. It must be noted that much of this tar does not contain any large amount of the desirable hydro-carbons because an effort is made to retain as large an amount as possible of these substances in the gas in order to improve the illumination power. On an average when coal is distilled, it will give approximately 12,000 cubic feet of gas; from seven to 25 pounds of ammonium sulphate; 120 pounds of tar, and from 1200 to 1500 pounds of coke. From the redistillation of the tar are obtained the fundamental crudes which are used for the production of artificial dyestuffs. products are as follows: benzene, toluene, xylene, phenol, cresol, naphthalene, anthracene, methyl anthracene, phenanthrene, and carbazol. In this distillation, it must be realized that the various substances which are mentioned are obtained in varying amounts, some obtained in extremely small quantities; thus, for the ton of coal there will be from ten to twenty pounds of benzene, three pounds of toluene, one and a half pounds of xylene, one-half pound of phenol, threeeigths of a pound of naphthalene, a quarter of a pound of anthracene, and about eighty pounds of pitch. This is from the approximate 120 pounds of tar obtained in the original distillation of one ton of soft coal.

One of the greatest difficulties is and has been to keep the production of various products in balance so that there will be no waste. The German industry, being so well organized, was able to develop certain new products to take care of any extra waste material which happened to be produced in the process of dye making, and it must be admitted that the number of products which must be handled in this manner has been very large. Thus in 1910, it has been estimated that the domestic production of gas tar amounted to about 100,000,000 gallons and that it was possible to obt

ter approximately 1600 tons of benzol, 2500 tons of toluol and xylol, 1300 tons of phenol, 22,500 tons of naphthalene, and 2200 tons of anthracene, with the other constituents about in the proportions indicated as obtained in the distillation.

One of the difficulties in the development of a dyestuffs industry has been the fact that many of the coke plants in the United States were equipped with the old fashioned so-called bee-hive ovens which allow all of the gas, ammonia and tar to be wasted. There have been modern condensation plants installed recently although because they are rather expensive and there was no necessity for the recovery of the by-products there was little effort noted previous to the war to install them.

To indicate the improvement in recovery, the amount of tar recovered in 1910 was 66,300,000 gallons, while in 1912 it had increased to 94,300,000 gallons. It would, however, be possible to recover from the 65,000,000 tons of coal now used in coking ovens approximately 3,350,000 tons of tar, or approximately three and a half times the amount actually being saved in 1915. The amount of tar obtained in 1913 was 115,-145,025 gallons; in 1914, 109,901,315 gallons; in 1915, 138,414,601 gallons; in 1916, 185,506,024 gallons; 1917, 221,999,064 gallons; 1918, 263,299,470 gallons. The expansion in the production of the coal-tar is particularly apparent and is due first to the necessity for saving these products in order to obtain the substances necessary for use in the war, and second because the saving of the materials has been much more profitable than at any time in the past.

The increased production in the distillation of coal tar during the war made a sufficient supply available to domestic manufacturers, but at the same time with the lack of incentive after the war terminated, there has been a more or less remarkable decrease in the production of certain of the chemicals mentioned. For instance, in 1919 the output of crude naphthalene was 12,612,-203 pounds, while in 1918 the production was 40,138,092 pounds. The foregoing figures are not entirely accurate and are not total productions, merely because some of this product is not tabulated inasmuch as it is merely one of the steps in the production of finished dyes and no record is kept when it is merely one of the steps in the

This might be explained by stating that the production of certain dyestuffs in certain quantities would naturally indicate a very much larger production of naphthalene and other products than are actually given in the records, but the production has been absorbed as made and only the finished product is given, thus causing some confusion in regard to the expansion in production on certain necessary intermediates.

There are ten coal tar crudes made. From these crudes there are produced approximately 300 intermediates which in themselves are used at times for certain particular results in the dyeing or finishing of textiles. From these 300 intermediates there are produced approximately 900 finished dyes. It is true that a much larger number of marks or designations or, as some have assumed, dyestuffs have been made, but the multiplication has been largely due to the

not necessary that each particular result must go through all of the various processes which have been mentioned, but the outline indicates to some extent at least what must be accomplished for many of the products. The idea is that many products are produced other than those actually desired, which are a necessity if satisfactory reactions are to be obtained for the production of the desired chemical result.

In connection with the production of either intermediates or dyestuffs, although possibly to a greater extent in connection with the dyestuffs, it is well to state that one of the most necessary considerations is regularity of product. A great amount of dye has been thrown away because it varies and it is stated



Manchester Print Works, Manchester, N. H.

adoption of different marks for dyestuffs which are identical or nearly so.

In order to make clear what has occurred, it might be well to emphasize the fact that the shortage of dyes in the domestic market due to the war made larger production necessary and the high prices secured warranted it, but at the same time the policy adopted in regard to the operation of the foreign dye patents which have been granted to domestic manufacturers was also of service. There are quite a number of operations necessary for the transformation of crudes into intermediates. Of course many other processes than those mentioned are necessary, but the chief processes are given as nitration, chlorination, sulphonation, reduction, oxidation, caustic fusion, alkylation, liming, condensation, carboxylation, diazotizing, and coupling. Of course many mechanical operations are noted and it is

that even in the German concerns there will be such irregularity in product that some established basis must be noted to which the concentration can be brought, or rather that the dyes can be reduced to a point where they can be handled satisfactorily. even extremely small quantities of any impure product will make the dyestuffs unsatisfactory for use. This irregularity has been one of the difficult problems to solve in the domestic market and explains to a large extent why the production of some of those dyes which are most wanted has not increased as rapidly as many could have desired. The problem is both chemical and mechanical, thus making it more difficult than might be expected. It is easy enough to indicate what the composition of the product is to be, but it is decidedly difficult to obtain the result in practice. The domestic industry was decidedly handicapped, not

only because it was necessary to develop the production of the dvestuffs, but in addition because it was first necessary to develop the production of the intermediates and this in many instances involved greater difficulties and larger expenses because of the possible losses than the production of certain dyestuffs.

EXPANSION IN INTERMEDIATES

As a basis for dyestuff production and because intermediates are necessary for explosive making and also for dyestuff making, it may be well to indicate something in regard to the increase in production and also indicate how the situation has not entirely settled at the present time. In the years previous to the war, the dyestuffs made in the United States were produced almost entirely from intermediate materials purchased in Germany or in other countries and imported. The only important variation from this took place in connection with aniline which was developed in 1910 and the production of which had reached approximately 1,800,000 pounds during 1914, though this was the production of a single establishment. Due to the war production of this rapidly increased and a relatively large number of concerns were making the article. Thus in 1916 the rate of production was nearly eighteen times as great as in 1914 and the production in 1919 was given as 24,345,786 pounds. The imports of coal tar crudes, that is, ten primary products, had a value of \$4,-596,203. The products largely imported consisted of 59,271,677 gallons of creosote oil, 8,393,216 pounds of phenol or carbolic acid, and 3,880,108 pounds of naphthalene.

The other crudes were imported in much smaller quantities. The imports of coal tar intermediates for the year ending June 30th. 1914, amounted to 10,165,896 pounds with a net value, as stated by European producers, of \$1,082,775. The number of intermediate products imported was approximately ninety in number, thus indicating to some extent the rather limited production of domestic dyestuffs. The domestic production of intermediates during 1918 had increased to 357,662,251 pounds, while the production during 1919 declined to 177,362,426 The values are not a very good basis for estimating the relative production because prices have declined, particularly upon some products during the last year or two, or since the war terminated. By far the greatest decline in the figures which have been given as to intermediate production is the result of the decreases in production of phenol which declined from 106,749,277

pounds to 1,543,659 pounds, a decrease of approximately 105,000,000 pounds. There was also a decrease in the production of naphthalene from about 28,000,000 pounds

to about 17,500,000 pounds.

Upon the intermediates required for dyestuffs production, however, particularly upon the most necessary ones, there has been a rather important increase, thus upon the socalled H acid, there had been an increase from 2,883,228 pounds to 3,837,534 pounds. A certain portion of the decline in production has been the result of an accumulation in the supply of certain intermediates left on hand at the termination of the war, which had to be consumed before further large production could occur, otherwise the price would have been forced to levels lower than those actually noted. It is stated that the surplus of phenol on hand at the termination of the war was about 35,000,000 pounds and the price declined from approximately forty-five cents per pound to about six cents, although it soon advanced to about fifteen cents per pound. It is very likely that the consumption of this product will be greater than obtained from the distillation of coal tar and that some of the synthetic production will be resumed at whatever time it is necessary to obtain the material mentioned. The fact that the amount of production was relatively large is the important consideration. It can be seen that progress has been made.

It is no surprise that the production of certain products necessary for war has declined radically, but the idea is that these products have been made when necessary and that there is at least a skeleton industry with chemists available if at any time they should be needed. The number of intermediates produced during 1919 numbered eighty-eight, being approximately the same as the number purchased from foreign sources previous to the war, thus indicating that for a great many dyestuffs there is little justification for any further importation.

It is true that the production of intermediates is gradually expanding and with suitable protection and satisfactory profit in the making of the finished dyes there ought to be expansion up to the number of intermediates necessary for the production of the dvestuffs used with possibly the exception of those dyestuffs which are used in exceedingly small quantities and for which provision can scarcely be made and the manufacture of which is not fundamentally necessary in connection with chemical protection.

Much is yet to be accomplished because the making of those intermediates necessary

for the production of the most desirable colors, which naturally are used in smallest quantities, has not been attempted, except possibly on a laboratory basis rather than on any practical basis. It must be realized that the intermediates in themselves are of some importance in the dveing of textiles. that is, they are used for developers or for printing, oxidation, for shading certain dyes, or in combination with some of the dyestuffs to produce the correct result. Certain of the intermediates are used for discharge printing or for other purposes of a somewhat similar character. The more complicated the handling or finishing of fabrics becomes, the more involved the combination of products will become and thus the whole industry becomes co-related and only the best results can be obtained by having available those chemical compounds which are required. It will thus be noted that the intermediates are of more importance than the mere production of finished dyes because in themselves they are of importance in the finishing of fabrics.

COMPLETED ARTICLES

It must not be assumed that the production of intermediate products from coal tar crudes is desirable merely for the making of dyestuffs in the textile trade, since many other industries require the products and a large number of articles other than dyestuffs are not only required but are produced. Of course dyestuffs are perhaps the most important, but there are in addition, the color lakes, medicinal preparations, photographic developers, materials used in the production of perfumes and flavors, synthetic phenolic resins, tanning compositions, and also explosive chemicals. Of course these are required in fair quantities during peace but are required extensively during war and perhaps it would be no surprise if many new compositions in much larger quantities were required in any future wars.

It is for this reason that so much emphasis is placed upon the necessity for a relatively strong and sufficiently large chemical industry which would be in a position to produce rapidly whatever chemical products might be required. Many of the various products are used in different industries and overlap and it is quite evident that many classifications or uses might be mentioned if it were considered desirable. All the time the importance and number of uses of various chemical compositions is increasing and where the material is a necessity, there is little doubt but that production will be provided,

but it is extremely difficult to decide upon the desirability of the production of certain dyes, for instance, if it so happens that it can be obtained only at a relatively high cost with the quality not all that could be desired.

The effect upon the progress in this industry or the ability to sell goods in which such dyes were used is rather uncertain. Because the relation is very close between the dye industry and the manufacture of many other chemicals used in other industries, it naturally follows that the production of dyes in large quantities would naturally necessitate that of many other chemical compounds in order to use the by-products and possibly because the chemicals desired could be produced under such conditions more conveniently and perhaps at a lower cost. The importation of dyes in 1914 amounted to 45,950,895 pounds. The domestic production amounted to 6,619,729 pounds or approximately thirteen per cent of the total consumption. In 1917 the domestic production of dyes had increased to approximately the same quantity as was imported in 1914, namely 45,977,246 pounds. The production in 1918 was 58,464,446 pounds and in 1919 it was 63,402,194 pounds. It will thus be apparent what remarkable progress has been made, not only in the quantity of dyestuffs made, but in the production of the intermediates which were first required before the dyes could be completed. In addition there was a relatively large production of color lakes, medicinals photographic chemicals, flavors, perfumes, etc. The total quantity of finished coal tar products was 76,802,959 pounds in 1918 and 82,532,390 pounds in 1919. The following table indicates to what extent the dyestuff production has expanded:

TABLE OF PRODUCTION

TABLE OF PRODUCTION				
	od'n, 1918	Pounds Prod'n, 1919 82.532.390		
Total finished coal-tar products	76,602,939	02,332,370		
Naphthol green	22,465 307,702	34,646 440,924		
Monoazo Dyes.				
Butteryellow	27,669 376,495 137,035 29,670	31,156 314,581 220,542 75,868		
Croceine orange	30.824	17,274		
Alizarin yellow GG	2,233,208	163,170		
Alizarin yellow R	385,910	130,424		
Ponceau 2 R	1,189,054	552,680		
Bordeaux B	200,415	161,862		
Orange II	916,890	1,133,925 267,582		
Fastred A	242,215 79,779	187.264		
Amaranth	73,539	294,416		
Lithol red R	353,104	269,169		
Salicine black U	469,159	739,372		
Total monoazo dyes,	8,581,763	8,881,810		

Name of Dye	Pound Prod'n, 1918	s Pounds Prod'n, 1919
Disazo Dyes Algama black IOB Brilliant croceine Bismark brown Y Bismark brown 2R Paper yellow Chrysophenine G	1,158,30 84,64 378,20 295,08	9 1,877,860 3 157,509 8 412,574 0 631,308 4 48,723
Chrysophenine G Congo red Benzo blue 2B Benzo orange R Chrysamine G Benzo purpurine 4B Benzo blue 3B	1,66 41,66 587,15 1,523,98 50,42 28,84 356,52	9 1,877.860 3 157.509 4 12,574 0 631,308 4 48,723 3 86,795 3 873.734 5 1,380.335 2 42,807 5 4,279 2 288,021 5 182,946
Total disazo dyes, Trisazo Dyes Oxamine green B Oxamine green GX	7,459,60	1 9,307,768
Total trisazo dyes		
Total azo dyes,	24,931,55	6 27,191,371
Diphenylmethane Dyes Auramine	45,63	4 127,567
Triphenylmethane Dyes Malachite green Magenta Methyl violet Alkali blue	290,41 71,67 632,19 43,18	6 560,301 5 155,830 6 574,436 77,796
Total triphenylmethane dyes, . Xanthone Dyes		
Eosine	161,15	3 121,303
Triobenzenyi Dyes Primuline	72,78	8 271,338 6 54,077
Oxazine and Thiazine Dyes Gallocyanine Methylene blue	435,46	365,243 2 465,992
Azine Dyes Safranine New fast gray Induline (spirit soluble) Nigrosine (spirit soluble) Induline (water soluble) Nigrosine (water soluble)	16.74	1 131,042 6 28,458 19 436,201 1 346,167 14 130,704 13 1,660,149
Sulphur Dyes Sulphur black Sulphur blue Sulphur brown Sulphur green or olive Sulphur green or olive Sulphur yellow and orange	12,385,13 1,056,69 5,309,04 364,69 521,42	14.504,770 1 1,622,762 4 805,861 18 277,641
Sulphur tan	337,32	
Indigo and its Derivatives		
Indigotine or indigo extract	1,434,70	1,699 670
Total dyes,	58,464,44	63,402,194
Color Lakes	753,24 1,042,86 632,88 694,33 165,03 1,828,99 1,258,36 245,00 1,913,12 303,51 632,66	543,201 3466,977 6697,699 0246,710 9484,306 22,101,527 44865,536 7259,378 3610,445 1524,030
Eosine Lithol red	303,51	524,030
Total color lakes,	9,590,53	7,569,921
Photographic Chemicals Hydroquinone Methl p-ami dophenol sulphate (Metol)	305,77	
(Metol)		
rotar photographic chemical	310,74	333,309

Name of Dye		Pounds
Medicinais	d'n, 1918	Prod'n, 1919
Acetanilid, U. S. P	939,062	918,795
Acetylsalicylic acid (aspirin)	961,113	1,777,105
b-Naphthol benzoate	13.975	36,701
Phenol sulphonates	55.913	33,711
Salol	271.945	124,034
Sodium salicylate	547,117	301,518
Total medicinals,	3,623,352	6,777,988
Flavors		
Saccharin	425,600	547,988
Total flavors	458,256	610,825
Perfume Materials		
Benzyl acetate	30,193	17,049
Total perfume materials,	116,263	41,419
	918	1919
Value of Production on Coal- Tar Products\$	83,815,746	\$84,585,544

Perhaps it would be more apparent what progress has occurred through combining the production of certain classes of dyes. Direct dyes were imported in 1914 up to 10,264,757 pounds. The production in 1919 of similar dyes in the United States was 14,444,934 pounds, thus being larger in amount than the importations in 1914, although of course it must be noted that the quantities of some were undoubtedly larger than imported while possibly the amounts of others, possibly more desirable, were smaller. On indigo a more or less remarkable change has occurred. In 1914 the imports of indigo were 8,407,359 pounds. The production of indigo in the United States in 1917 was 274,771 pounds, in 1918, 3,083,-888 pounds, in 1919, 8,863,824 pounds, thus being about 450,000 pounds more than were imported in 1914. Thus it should be quite apparent that the demand for artificial indigo is being fully supplied and that no danger exists of any large importations unless insufficient protection should be afforded.

This is not true, however, of other vat dyes which are quite necessary and very desirable. The importation in 1914 was 1,-945,304 pounds while the domestic production for 1917 was only 14,525 pounds; for 1918, 197,449 pounds, and for 1919, 389,-158 pounds. The progress is relatively slow and it is not at all certain when a sufficient supply can become available and it is in these vat dyes that the demand was increasing most rapidly when the war started. The importation of acid dyes in 1914 amounted to 9,286,501 pounds, while the production in the United States in 1917 was 9,372,121 pounds; in 1918, 9,799,071 pounds; and 1919, 12,195, 968 pounds.

It is in connection with the sulphur and mordant colors that there has been a decline, though this is readily explainable. The imports of sulphur colors were 7.053,879

pounds in 1914, while the production in 1917 was 15,588,222 pounds; in 1918, 23,-698,826 pounds, and in 1919, 17,624,418 pounds. The importations of mordant colors in 1914 were 4,450,442 pounds. The production in 1917 was 4,164,902 pounds; in 1918, 5,447,192 pounds; and in 1919, 3,985,050 pounds. There has also been a rather large decline in the production of unclassified dyes, that is, from a production of 2,368,541 pounds in 1917 to 49,111 pounds in 1919. This decline, as well as the decline in production of sulphur colors has been due to an improvement in the character of the domestic dyestuffs made and to the substitution of other colors for sulphur colors as soon as it was possible. It is more or less certain that there will be a further decline in the production of sulphur colors. At least only a moderate increase in the demand from that during 1914 can be expected, since the very large production of these colors arose from their ease of manufacture and the necessity for making them in order to dye fabrics, because the ordinary colors previously used were not available.

The pounds of color made are not a particularly good guide to expansion in the industry, since many of the desirable colors are always likely to be sold in rather small quantities and at relatively high prices. This is because the methods of production are expensive and there is a decided trend among manufacturers to color fabrics in the most economical method. It is a fact that this policy is much less evident in the United States than in other countries, since it seldom or never happens that foreign manufacturers use a high quality of expensive dyestuff in the production of very low qual-

ity materials.

Many domestic manufacturers have used expensive dyestuffs even though the fabrics have sold at relatively low prices, merely because they have realized that shade or attractiveness or perhaps permanence of color has been of decided importance in their distribution. It still remains true that the opportunity for the production and distribution of high priced dyestuffs is greater in the United States than, perhaps, in any other country; but it may be that conditions exist which will prevent large production of the dvestuffs referred to.

At the same time attention must be drawn to the fact that progress can come only by degrees and remarkable progress has already occurred in a comparatively short period of time, in fact much greater progress in the production than anyone would have considered possible only a few years ago. Do-

mestic manufacturers of fabrics were first compelled to build up the production of staple fabrics and those of relatively low quality before they could expect to develop either the methods or the personnel capable of handling the high quality fancy materials or those which contain silk and sell at exceptionally high prices because of special desirability. Specialties are only likely to be developed after there is a very good industry established on staples, and undoubtedly over a period of time and after sufficient experimentation certain satisfactory quantities of the more expensive dyestuffs will be produced.

The quantities of certain dyes are increasing or decreasing continually, depending somewhat upon their cost or desirability, but also to an extent based upon the particular requirements in the dyeing and finishing trade. Sometimes one variety of color is necessary in large quantities while for some other season a greater production of other dvestuffs is a necessity. This is one of the reasons why no definite estimate can be made as to the possible requirements from season to season. More or less emphasis must be placed upon very satisfactory and large increase in production of indigo. At one time it was believed that the domestic production of this dye would be impossible, but there is little doubt but that the demand for it can be readily supplied. To what extent the more desirable and expensive vat dyes can be developed is yet to be determined. Many claims have been made that certain of these products have been successfully made, but when the production has been attempted commercially, the results have not always been what could be desired. As yet, the production of vat dyes is only a very small portion of the possible domestic demand, in fact it is extremely likely that were the production of such dyes actually accomplished in high quality and at a relatively low cost, there would be much substitution of the vat dyes for others which have been used regularly.

The consumption of these dyes was possibly only just commencing when the difficulties in regard to importation developed and the adaption of such colors to the different fabrics has not proceeded very far. In addition, the extent to which such dyes might be used in the silk trade has not been determined, although naturally because the silk yarn consumed is rather light in weight, the poundage of such dyes which might be used as compared with cotton would be more or less restricted. The added cost of coloring materials by means of expensive dyes as

compared with ordinary dyes might not be very great, particularly if the demand for the expensive dyestuffs became such that larger quantities could be produced. should be stated, however, that in many materials the production cannot be in lots greater than 100 pounds in concentrated form under present manufacturing methods, although there are other dyestuffs which can be made in larger quantities, perhaps, up to, or in excess of, 2000 pounds per batch. While the process is mechanical and chemical, the combinations cannot occur satisfactorily in large quantities, thus limiting the production. Naturally, because these dyestuffs are very difficult to make, the greatest amount of technical skill, the largest number of intermediates and more research are required in their production. This tends to make their costs high although the relatively small production per batch is also of imnortance.

The industry at present appears to have reached a point where a much larger production of the desired vat dyes is in time likely, if conditions are suitable, but there are not many who are willing to risk large amounts in their manufacture unless they have reasonable assurance as to the future. since the capital required is relatively large for the poundage produced, even though a relatively large industry has been established already in so far as many ordinary

dvestuffs are concerned.

Something is to be said also in regard to future developments in the discovery and production of new dves or new combinations for new and more desirable effects on fabrics. The expansion in the chemical industry has been so rapid and the requirements in the trade so disturbed that possibly satisfactory balance has not been established as yet. While the actual requirements on certain dyes are known it is not apparent to what extent the difficulties or limitations during the war have affected the demand for any particular product. It must be noted that in the distribution of many of the dyes relatively large expenditures were necessary in order to keep them well established or to secure their introduction. The costs of dis-tribution were exceedingly large as compared with producing costs. With some additional expense eliminated, it may be possible that domestic producers could offer the highest quality dyes—those made in small quantities –at prices which would make their distribution as sure as is now accomplished in the ordinary dyes which are made in much larger quantities.

There is little doubt but that foreign dyestuffs makers will be at a decided disadvantage as compared with the past since the very large production of the staple dyestuffs afford an opportunity for further development and for decreasing the costs of distribution on those dyes produced in small quantities, a condition which did not exist previous to the war. Any excessive cost in the high quality materials in foreign concerns cannot be carried by the staple dyes since there is little possibility that these will be imported in any large quantities.

In connection with the development of the domestic dyestuffs industry, it is, perhaps, interesting to note that not only has a sufficient supply been developed for the domestic demand even though the character of the colors, or rather variety, is not all that could be desired, but there has been also a relatively large export of certain materials, thus placing domestic producers in a much stronger position, as this exportation adds to the distribution and tends to decrease the costs of production, while at the same time it tends to limit the amount of dyestuffs which foreign producers can make, also tending to increase their costs of production and also of distribution. Thus the production of certain dyestuffs in the United States during 1919 had developed to a point sufficiently great to permit of a certain amount of exportation and on some dyes rather large quantities have been sold for foreign use, though this has been particularly for Japan and China.

During 1919 dyes and dyestuffs were exported from the United States to the value of \$17,084,435, and of this amount aniline dyes represented \$10,724,071, logwood extract \$1,355,936, while other dyestuffs amounted to \$5,004,428. For the nine months ending September 30th, 1920, the exports of dyes and dyestuffs amounted to \$26,032,389, which is an annual rate of nearly \$35,000,000. Naturally, quite a portion of this large valuation is due to the high price at which dyestuffs have been selling, rather than to an excessive poundage, but the increase in exports is well worth referring to. Of the amount exported, aniline dves constituted \$17,038,235, logwood ex-\$2,321,090, while other dyes

amounted to \$6,673,064.

This amount of exports exceeds by far the value of the total imports during the year 1914, so that instead of being dependent upon foreign production, the United States producers are able to export more dyestuffs in value than the industry required before the war. It must not be assumed that this

condition will continue because a large portion of the exportation has possibly been due to lack of competition or for other similar reasons and the demand may not hold up so large in competition, although it would be surprising if any very large percentage of this export trade were lost, if anything like the effort which has been made continues. The dyes which have been exported include sulphur colors in which the production been large, although, as noted, there has been a decline, due to less demand, synthetic indigo, as direct cotton dyes, acid dyes, and certain basic dyes. be emphasized that the larger the production and the greater the exportation the lower the costs of production upon many dyestuffs are likely to be and this is true even if the amounts of dye per batch be relatively small.

As an indication of the changes in production, it might be stated that the number of manufacturers producing crudes in 1918 was thirty-five while in 1919 it had declined to twenty-four. The number producing intermediates in 1918 was 128, while in 1919 it was 116. The number producing finished coal tar products was 155 in 1919. It is interesting to note, however, that on dyestuffs the number of producers was seventyeight in 1918 and ninety in 1919, while in 1914 the number was seven. Twenty-nine were producing color lakes in 1918, and thirty-four in 1919. The number producing chemicals for photography was six in 1918 and 10 in 1919. The number interested in other finished products has remained practically stationary for a number of years, although their manufacture undoubtedly increased in variety and quantity.

CO-RELATED PRODUCTS

The coal tar industry, however, is not alone responsible for the production of dyes which are used for coloring fabrics, inks, leather, paper, and other more or less necessary purposes, but it is responsible for the development of many new medicinals which have undoubtedly been of great service to physicians and it is quite possible that the service which they may render has by no means reached its high point. For instance, during the wars of the past, wounds usually resulted in death or amputation when they were serious, while the ease of production and the effect of many of the available chemicals has now permitted a large percentage of those who are wounded to remain in the service. Many of the older natural medicines were not only difficult to obtain and therefore expensive, but in addition were decidedly irregular in their chemical compositions, depending upon their source of origin, and for this reason the development of new remedies of a synthetic character because of strength or regularity has been especially important.

The desirability of some of the new antiseptics cannot be over-estimated and accordingly it would perhaps be a mistake to depend too much upon any certain country for the necessary medicinals, since at a time when they might be needed, they possibly could not be obtained except with great difficulty. Flavine is a dyestuff, but at the same time, it is a powerful antiseptic and it does not interfere with the action of the white corpuscles in the blood unless the percentage of strength is incorrect. Another desirable product, only one of a series, is ace-The industry developed from the production of salicylic acid in 1874. This is a remedy or chemical used extensively for rheumatism, but there are many other compounds made and perhaps the ease in production and the relatively low prices has been responsible for a somewhat greater use than is justified or warranted by the needs of consumers. Other chemicals which are exceedingly useful, though at the same time relatively dangerous, are those known as sulphonal, veronal, and medinal. The same thing is noted in connection with cocaine. which has its uses, but also should be limited in its distribution.

Naturally the production of many medicinal compounds depends entirely upon the permanence of the domestic dyestuffs industry and the outlook for expansion is somewhat dependent upon large production of dyestuffs, since it is very likely that other chemical combinations will be even more necessary in the future than some of those in use at the present time. It might be relatively easy to continue this industry without the dyestuff industry by importing the intermediates or chemical compounds necessary. but the danger in this condition is that it might be impossible to obtain the finished compound should it become difficult to obtain what might be considered the raw materials necessary for completion. This is the condition which did exist when the war started in connection with the production of dyestuffs. Certain finished dyes could be made but there was no method by which the necessary intermediates could be secured except by developing this industry, since dependence had been placed upon others for the necessary intermediates.

To a smaller extent the same conditions referred to in regard to medicinals exist in connection with photographic chemicals and other products. The production of perfumes and flavors, while perhaps relatively small in poundage, is nevertheless relatively important since many small industries are more or less dependent upon the supply of the necessary chemicals. No doubt not a little disturbance would take place should any unusual condition develop in connection with the production of necessary intermediates. Industry has become decidedly complicated and there is much greater dependence upon other industries than was the case in the past, and perhaps for this reason the fundamental industries must be cultivated or kept in a flourishing condition. It is possible to do without a great many articles, but it is impossible to dispense with many of the compounds which are now produced from the distillation of coal tar.

A great amount of attention has been given to the development of the industry and much of its progress will be based upon a satisfactory amount of research work. Such research as might be made at present would have been practically impossible some years ago, but if the industry is to continue its progress, a great amount of this kind of work must be done and a relatively large amount of money must be spent in this direction. This cannot be emphasized too strongly since one of the large German concerns in 1912 employed 7680 workmen, 374 foremen, 307 chemists, and seventy-four engineers. Approximately 30,000 horsepower was required for operation. Another German organization employed approximately 8000 workmen, 217 chemists, 142 engineers, and had a commercial staff of 918.

Perhaps the research work need not be relatively so important in the United States, since the reactions and many of the processes are well known and the mechanical apparatus has been definitely established, but it is more difficult to obtain the higher quality results or the more complicated chemical compounds than is the case for those of a more simple character. With suitable and sufficient research, there ought to be no question in regard to further domestic progress, although certainly the increase in production and in variety of products is likely to be much slower than during the last few years. No one could expect such progress to continue since the incentive is less than it was and the necessities have largely been taken care of.

A REVERSAL IN CONDITIONS

It has been indicated in this chapter as to what extent the production of dyes has increased in the United States, but it must be realized that importations still continue. Thus, for the year ending June 30, 1920, the total number of pounds of dyes imported was 3,501,147. This quantity consisted of the following amounts:

Direct dyes 694,757 p	
Indigo 520,347	**
Other vat dyes 421.798	**
Acid dyes 851,220	**
Sulphur dyes 276,800	**
Mordant and chrome dyes 447,869	**
Basic dyes 230,529	**
Dyes for color lakes and soluble dyes 15,516	**
Unclassified dyes 42,311	**

lt is well to note that the importation of vat dyes, other than indigo, was 421,798 pounds, while the domestic production for 1919 was only 389,158 pounds. This total quantity available is decidedly less than was imported in 1914, when the total imports were 1,945,304 pounds. It will be apparent that there was a shortage of at least 1,135,-000 pounds approximately, to say nothing about the possible increase in demand for these dyes or the fact that there might have been some accumulation in the vat dyes previous to 1914, which fact may have made the actual relation of the supply at that time and the supply at present somewhat greater even than the figures indicate.

There is also something to be said in regard to the character of the dyestuffs produced. The figures which have been given in themselves should be considered only relative, and inasmuch as two chemical compounds of any particular composition ought always to be identical, nevertheless the conditions which forced rapid expansion in production also tended to make the product obtained more irregular in character and likely to be of less concentrated nature. not a criticism of domestic production, since the improvement has been very large and more or less remarkable, but the lack of experience, the facts that the industry is newer, and that there has been less opportunity for research, and the establishment of what might be considered the best practices have tended to affect the quality somewhat.

There is no doubt but that improvement is gradually being made in the refining of the processes necessary and in the relative regularity of the dyestuffs obtained, but there is much to be accomplished in this direction, to say nothing about the introduction of new dyestuffs which up to the present time have not been attempted by domestic producers, except possibly where the production is not large, in fact, totally insufficient for the requirements of the industry, based upon what those who require dyestuffs would like to observe. In another direction the necessity for a larger dyestuffs industry than in the

HISTORY OF AMERICAN TEXTILES.

past is apparent, since the quantity of tanning materials required is increasing. This is based upon the fact that the tanning compounds which have been used in the past are decreasing and through improvements in the handling processes, chemical substances or derivatives of coal-tar are being used with

increasing success and in larger quantities. It is also more or less certain that for many other industries coal-tar products will become of greater importance as the industries become more complicated. The chart which is given indicates in a general way what results from the distillation of coal-tar.



Amory Mill, Manchester, N. H.

CHAPTER FOURTEEN

COMMISSION HOUSES AND SELLING AGENCIES

There may be some question as to which is the largest manufacturing industry in the United States. If combined iron and steel manufacturing is larger than the combined textile industries, the difference is very slight in favor of the metal, although it may be truly said that all of the textile branches together constitute the largest manufacturing industry in the United States. The U.S. census figures will bear out this statement. In any event the merchandising of the textile products manufactured in the United States, that is, the merchandising in the primary markets, is one of the most stupendous marketing problems of the country. The growth of the primary textile distributing markets has, of course, kept pace with the expansion of the country and the increasing importance of the United States as an exporting nation.

Many of the customs of all American business arose first of all in the merchandising of textiles. There is not a business man in the country who is not today more or less familiar with acceptances and bank acceptances. It is well understood that the first form of acceptances used in business in the United States were the acceptances of the dry goods commission merchants. These acceptances differ from those current in European countries or the banking acceptances as they are handled in the Federal Reserve Banks. The original dry goods commission house acceptance was the acceptance of a draft made by the mill on a commission house. These drafts, after being endorsed "accepted" by the selling agent, became marketable paper and were handled—and are this day handled-by note brokers just as are other forms of commercial paper.

A very large part of the investable funds of banks of the United States, including the national banks, trust companies, and savings banks, are represented in purchases of commercial paper. The theory of banking is that the funds of any bank of discount should not be put solely into loans to the bank's own customers nor into loans to local borrowers, but should be spread out over the various industries of the country and loaned to borrowers of the highest credit located in different parts of the country.

On this basis, no local catastrophe or business depression would strongly and adversely affect any individual bank, no matter where located. A very large part of the borrowing of the country is done not direct by the individual borrower, but through a commercial paper house-a note broker. The foundation of the commercial paper business of the country, the growth of the note brokerage profession, started with the borrowings of textile mills and commission houses. Today the largest note brokers of the country deal to a very great extent in textile mill paper carrying commission house endorsements. Some of the largest banking houses deal almost exclusively with endorsed textile mill notes. The commission houses are not only great selling agents, but they are also great commercial bankers in some cases, or great reservoirs of credit in other instances.

The textile industry of the country started pretty much upon commission house foundations, including commission house capital and commission house financing. Our great cotton and woolen and other textile manufacturing organizations were largely built up by the merchandising ability of the old time and present day commission merchants, and the financing of the mills in a great majority of cases depended upon the advancement of capital by the commission merchants.

Coincidently, the creation of the great dry goods jobbing industry of the country as a secondary textile market has largely depended upon the ability of the commission houses to carry merchandise and to carry merchants. Today it is true and it has been true for decades, that the jobbers anticipate the payment of merchandise accounts and justify their existence very largely because of their financial ability, but there never has been a time when the whole industry has not depended upon the ability of the mill selling agencies, the commission houses, to lend credit to the jobbing trade as well as to the mills.

The building up of the great needle trades, the garment manufacturers, and the cutting-up industries, has been a growth of recent years. Here also the financial as

well as the merchandising ability of the great primary merchants, the commission houses, has made possible the continued growth of textile manufacturing.

The great corporation commission houses representing mills of New England and the South are amongst the strongest institutions in the country from a financial standpoint. Members of these commission houses are directors and officers in the largest banks. These great merchant houses with home offices in Boston, New York and Philadelphia, and with branches in those cities and throughout the country, with partners of the individual commission house firms located in those larger cities, are closely allied not only with financial institutions but with the management of big business of every description. The textile industry has developed great captains of industry who control other great industrial and public service corporations.

The backbone of New England is textile manufacturing and this great industry has been built up chiefly because of the ability of great merchants who head the dry goods commission houses. The money from the earnings of the great textile industry had very much to do with the upbuilding of the West as evidenced by the naming of now large western cities for textile and dry goods merchants. The railroads of the West were very largely developed by capital that had accrued from cotton manufacturers and commission merchants. The great cotton manufacturing industry of the South was to a great extent promoted by New England manufacturers and commission merchants with the alliance of eastern textile machinery builders and banks.

The old line commission houses representing chiefly the New England mills and in many cases mills of the South also are as a rule chiefly merchants, as the business is conducted today, but in many cases they are also commercial bankers. One of the greatest textile manufacturing corporations in the United States producing both cotton and worsted goods has today an annual product of upwards of \$50,000,000. This mill now is one of the rich corporations of the country and its stockholders are not located in New England alone, but are in practically every center of the industry where investment funds have accrued. Originally, the commission house that handled the product of this mill was very largely financially interested in the mill. At one time it owned a third of the capital stock of the manufacturing corporation. During one business depression, it was necessary

for the commission house to guarantee the credit of the mill and to advance funds to continue its operation.

Today the mill is rich and has no need of direct financial assistance from the commission house, because years ago the latter sold its one-third capital stock interest in the mill, although it is probably true that all the partners of the commission house are individually stockholders in the manufacturing corporation. The mill borrows millions of dollars during the course of a business year and we think that in this particular case, the commission house endorses the notes of the corporation. The corporation itself has the highest credit, but the financial worth of the commission house runs into millions of dollars, and its endorsement adds to the already superabundant credit of the manufacturing corporation. Besides, this endorsement helps to secure for this particular mill the lowest discount

In the old days the commission house generally guaranteed the credit of all pur-chases. Today the old line commission houses handling the products of the financially strong mills and selling the goods only to jobbers and manufacturers of highest credit do not guarantee the accounts. In the particular mill under discussion the accounts are not guaranteed because the mill itself passes on the credits, because its volume of business is so large that it can afford to have on its books the names of buyers which it might be dangerous for a smaller organization to carry, and also because the manufacturing corporation in this particular instance, and there are many similar instances, has built up in the course of many years, a guaranty fund to take care of the small losses that might accrue in trading. The value of the commission house to this particular mill-and a similar condition rules in all similar instances—is in the merchandising ability of the members of the commission house.

It is seldom true that one manufacturer or one manufacturing organization contains within itself in any great measure the three necessary elements of business success, namely, manufacturing ability, financial ability and merchandising ability. The manufacturing ability is, of course, within the manufacturing organization. The financial ability is in the treasurer and the board of directors, and the merchandising ability is in the commission house. Great merchandising sense is no more common than great ability in any of the arts or sciences. Really great railroad heads, really great bankers,

really great musicians, etc., through the industries, arts and sciences are few. So are great merchants. Hence, several mills or many mills avail themselves of the merchandising ability of some one particular commission house which is headed by great merchants, just as clients gravitate to one great successful lawyer, so that a few individual legal lights stand out amongst an army of lawyers. In the same way, a few great commission houses stand out in the textile industry and continue to be the leaders year after year.

The service of a certain commission house known to the writer as a representative of a particularly large and successful New England cotton and worsted manufacturing corporation is not then a financial service. It doesn't advance money to the mill. It doesn't guarantee accounts, but it does sell the product of the manufacturing corporation and theoretically does nothing else.

As an actual fact, the service of the commission house also to a very great extent outlines the policy of the mill. The commission house through its business ramifications, its branch offices, throughout the country and in foreign countries, and because of its merchandising sense, can best advise the manufacturer as to the time for purchasing raw material. Knowing business conditions, its advice on wage questions has value. With its ear to the ground and therefore posted as to what other mills are doing or contemplating, as well as familiar with the fabric productions of other manufacturers both domestic and foreign, it has possession of helpful ideas regarding machinery and manufacturing equipment.

Its advice in outlining the policy of the mills that it serves is a very definite function of the commission house. The improvements in fabric construction, quality, finish, etc., do not generally originate in the mill itself, but come rather from the suggestion of the selling agent so of the mill. It is the selling agent who discusses qualities and finishes with the buyer. The service of a commission house is of mightiest importance to the manufacturer. The merchant discovers the new markets. The mill very often does not know where its product goes or how it is used.

As an instance of the building up of business and the increasing profits due solely to a commission house, an example may be found in an old New England corporation which has made colored cotton goods and worsted goods for a great many years. This mill has had a bleachery in operation solely for the finishing of its own goods which

consisted wholly of light cotton cloths for women's wear. Within the last two or three years this bleachery has been doubled in size and sells hundreds of thousands of yards of heavy cotton goods used by shoe manufacturers. The shoe cloth business is large, primarily in Boston, though this class of cotton goods is used in practically every shoe manufacturing plant in the United States, whether located in Lynn, Brockton, Lynchburg, St. Louis or elsewhere.

Shoe cloths for many years were made in scores of heavy cotton mills. Thence by the particular commission house representing a certain mill the goods would be sold in the grey state to a shoe findings house, a shoe cloth converter, in Boston, through a grey goods cloth broker. The shoe findings house, the shoe cloth converter, would have the goods bleached or napped or starched for his own account and then sell them in large or small quantities to shoe manufacturers large or small. In scores of cases, these shoe cloth converters sold hundreds of thousands of dollars worth of cotton goods to shoe manufacturers, and the shoe manufacturer in scores of cases was much stronger, ten times as strong, fifty times as strong, financially, as the shoe cloth converter. That is, a very wealthy cotton mill selling through a very wealthy and large commission house would sell the grey cotton goods through a small broker to a small converter who in turn would have the goods finished in a small bleachery and then sell the goods to a very large shoe manufacturer.

The commission house that represents one of the large New England cotton mills, and this mill has never done any business for the shoe manufacturers or shoe cloth converters, decided that here was an industry which could be developed for the benefit of that cotton mill. The cotton mill has the necessary bleachery and buys the grey cloths as cheaply or to better advantage than can the converter. The cotton mill bleaches the goods at its bleachery and sells them direct to the great shoe manufacturers, cutting out the grey cloth broker, the converter and the jobber to the advantage of the trade generally and to the great advantage of this mill in particular. In other words, the commission house in this instance uncovered a business in the immediate volume of two or three million dollars per annum. The mill got the benefit of the merchandising ability of the great Practically all textile commission house. mill business is discovered and developed along similar lines. The development of

the uses of textiles in all other industries has been very largely that uncovered by commission houses which have brought about these great opportunities for business for the mill.

The service, then, of the commission house to the old established New England mill is almost solely a merchandising service, covering the country and in some instances the world, in search of business for these mills. The commission merchant discovers new markets and new uses for the textile products. He doesn't guarantee the accounts, as a general thing, but his knowledge of credits is so all-embracing that a guarantee of accounts is not necessary. In some cases the commission house of this kind outlines the policy of the mill, particularly where the merchant is interested in a large financial way in the mill. There is no one description that would fittingly explain the service and position of the commission house to cover all relations of every mill with the particular commission house. The standards of practice are about the same, the costs of selling are similar for mills on similar goods, but the arrangement between any individual mill and individual commission house is an individual thing and is based upon the requirements of the particular mill and the service of a particular commission house.

The commission houses representing the southern mills perform very much the same service as in the case of eastern mills, although there are particular instances where the service is broader and of a different nature. In long established and well financed southern mills, on grey goods for instance, the relations between such a mill and its selling agency are quite similar to the relation between the eastern mill and its selling agency. In other instances the commission house actually finances the mill, sometimes by endorsements only, sometimes by the acceptance of drafts, sometimes by the actual advancement of cash ahead of actual sales, but perhaps with some of the mill's assets pledged for the loan. One of the best regarded and well financed sheeting mills of the South selling through one of the most prominent commission houses has a contract which constitutes the commission house as the sole selling agent of its prod-The mill pays a commission of three and one-half per cent on the gross sales and this commission includes all charges incurred in the sale of the goods, including brokerage wherever there is any brokerage, but excepting insurance, freight, cartage and storage.

The commission house guarantees the sales, endorses the notes of the mill, and in behalf of this endorsement the mill pledges as collateral such amounts of cotton and manufactured goods as will secure the endorsements. The commission house renders an account of all sales made during each month at the close of each month and makes cash payments weekly covering the approximate amounts of goods sold during the week. On all such anticipated payments the mill



AMOS ADAMS LAWRENCE 1814-1886

Founder of the Commission House of Lawrence & Company in 1846, and Senior Member of this Firm until his death in 1326

pays interest at the rate of five per cent. This contract is similar to most commission house selling contracts covering southern grey goods and more or less similar to all such contracts for either colored or finished goods except as individual cond tions may be changed, depending upon particular conditions.

A very large portion of the cotton goods products of the country is sold direct, particularly grey unfinished goods. It is true

that a few of the very largest cotton mills handle their own selling. These mills have so large a product and are so well established that with a business as big as that of several average mills combined, they can afford to carry selling organizations as great as the average commission house. are mills that have within their own organizations the merchandising ability necessary to handle the sale of their product and mills that are so well financed that they do not need any endorsements or other assistance.

The grey cotton goods of the country are for the most part sold direct so far as eastern mills are concerned, as the majority of the latter handle the sale of their own product through the treasurer or otherwise. cases of this kind most of the goods go to brokers and the individual sales are actually consummated by an outside broker who receives a brokerage of one por cent or onehalf of one per cent. In cases of this kind the mills pass upon the credit, fix the prices at which the goods are sold and accept or refuse the business offered as it pleases them. A considerable volume of cloths in the grey, running into many millions of dollars per annum is sold by this method and through a comparatively few brokers large quantities of these grey goods going to the so-called converters. The latter are, as a matter of fact, merchants who buy the grey goods of plain or fancy construction, which may be styled by themselves or by the individual mills. Grey goods purchased in this way are bleached, dyed, printed or otherwise fin-ished at custom bleacheries and finishing plants, and then merchandised by the converters on the same basis as the finished products of other mills are marketed by the commission houses. The converting business has grown immensely in the last decade and continues to increase. It might be added that some producers of cloths in the grey sell the largest part of their product to converters through brokers, but they may also do a commission converting business for their own account through one of the commission houses which handles this kind of work.

The merchandising of woolen and worsted products, both men's wear and women's wear, has in comparatively recent years experienced a great change. Within the memory of even the younger woolen and worsted manufacturers the merchandising of these products has changed. products of woolen mills used to be handled in very much the same way as cotton goods today, that is, through large commission houses, and in an individual commission

house would rest the selling accounts of a considerable number of mills. Most of these old woolen and worsted commission houses have passed out. The passing was due to several conditions, chiefly as a result of the advances made in manufacturing and merchandising methods and also largely because the old woolen and worsted commission houses did not keep pace with the times as have the cotton goods selling agents. Perhaps, too, it was largely due to the fact that woolen manufacturing itself got into a rut and the improved worsteds took the place of the older carded woolens

to a very large extent.

Today most of the woolen and worsted goods are sold direct with direct selling agents located in New York and the other distributing markets. In most cases, however, even though the woolen mill or worsted mill product is sold by direct agents, the financing of the sale of these goods rests with a commercial banker—and in many instances these commercial bankers are the direct successors of the old woolen goods commission houses. The sales are actually made by the direct selling agent, but the credit is checked by a commercial banker and the accounts are assigned to him. Woolen and worsted goods, probably the largest proportion of them, are sold direct to the clothing manufacturers with a smaller proportion sold to the jobbers of woolens and worsteds who cater to the custom tailors. A considerable amount of the lighter weight goods used, chiefly for dress goods, are sold to a few great jobbing houses which handle products of that kind. Just as the great men's wear garment manufacturing industries have been built up in the last comparatively few years and have changed the methods of merchandising men's wear woolens and worsteds, so have the great needle trades and the cotton garment manufacturing industry grown up and changed somewhat the methods of distributing cotton goods.

Until within a comparatively few years, practically all of the finished cotton goods were sold to jobbers to be ultimately handled through retailers to reach the final consumer, but in recent years cotton garment trades making women's wear, shirts, skirts, aprons, and similar garments have reached immense proportions and the product of some cotton mills goes wholly to the garment trades while with other mills a portion would be fifty per cent to garment manufacturers and fifty per cent to jobbers. In the woolen and worsted trades, however, the proportion of mill products going to the garment manufacturers is much larger and the mills that cater to the woolen jobbing trade particularly are comparatively few in number.

As the business of jobbing dry goods is now conducted, it requires much capital and the liberal use of credit, that there may be carried, at convenient points of distribution, large assortments and plentiful quantities of the merchandise necessary to supply the wants of the retail trade. The stock so carried is the accumulation under one roof of the products of thousands of different manufacturers scattered over the entire face of the globe. These wares are thus made subject to the convenient and ready inspection of the individual customer who may call at the place of business of any particular jobbing house, and samples of them are also carried by the traveling salesmen of all the jobbing houses into every accessible hamlet of the

The jobber must invest his capital in this merchandise, take all the chances of the markets and be prepared to deliver the goods the moment his customer demands them. He must employ a large force of salesmen, and cover a wide scope of country. This he is enabled to do only because of the wide variety of the goods in which he deals, and the big volume of business transacted; he thus keeps to a lower figure the percentage of cost of marketing the wares than can be accomplished by any other method. In fact, the operating expense as well as the profit to the jobber is often in the cash discount that he receives from the manufacturer.

Again, the jobber must be prepared with his capital and credit to sell to his customers on liberal credit terms, and in many cases comes nearer being the banker of his customer than are the banks of the customer's own town. Margins have been cut until the only chance of conducting the business profitably lies in doing a substantial volume of business. What other means can the manufacturer find for the distribution of his product as economically as through the medium thus afforded by the jobber? It is out of the question for him to employ a force of salesmen sufficiently numerous to enable him to offer his wares to the large numbers of cus-

tomers who might be interested in them, for to do so would make the cost of marketing his product prohibitive. And for the same and other obvious reasons, it is equally as impossible for him to induce such retail merchants to visit his factory or to maintain exhibition stocks at the principal centers of trade.

Therefore, the jobber offers the manufacturer the most economical medium for the sale and distribution of his product in this country. That being conceded, there can be no question that it is to the interest of the manufacturer to protect the jobber. The retailer also has a large interest in the protection of the jobber, who furnishes him with the means of buying great varieties of merchandise in such quantities as may best suit his needs. It has been the history of the textile business that disaster comes to the retailer as often because of his yielding to the temptation of buying in greater quantities than his business demands, as from any other

A chief reason why the commission house does not sell direct to retailers generally is that it is not fair that the manufacturer should depend upon the jobber to buy in advance three-fourths of his product, so that he may have a basis upon which to operate the plant regularly and then take the other fourth to the most desirable of the jobber's customers and sell them in direct competition with the goods which he has previously sold to the jobber.

On the matter of selling direct to retailer, there are two sides to the proposition. It is admitted that there are some manufacturers who produce a grade of goods, a larger proportion of which must be marketed direct to the retailer. Again, there has grown up in the cities and sizable towns of the country the so-called department store, employing much capital, carrying extensive stocks of merchandise, and doing a great volume of business. This class of retailers, because of the big quantities of goods handled, may, with more or less justice, claim the right of making their purchases at first hand. This condition, and the right of the manufacturer to sell them certain lines, in proper quantities, has been more or less generally recognized.

CHAPTER FIFTEEN

MAGNITUDE OF THE TEXTILE INDUSTRY IN AMERICA

First in value of product in the United States, the textile industry is one of the strongest factors in the civilization and prosperity of this country. Every man, woman and child in the country is dependent on this industry for clothing. Some are more or less dependent on it for employment. A vast amount of the clothing worn by the inhabitants of this country is the product of the looms and knitting machines of America. With a population of 107,710,595, according to the census of 1920, is it any wonder that the value of the products of the textile industry has reached such large figures as more than \$3,500,000,000,* exceeding the value of the annual output of the iron and steel industry by \$276,000,-000? A recent estimate places the value of the product at between four and five billion dollars.

Much of the nation's wealth is invested in textile manufacturing interests. The source from which the money comes is far-reaching, and in many cases the investment is the nest-egg of citizens in different parts of the country, who are stockholders in the mills. The census also shows the textile industry to be the largest in the United States from the standpoint of capital invested, wages paid and operatives employed.

It is not only a fact that the industry is higher in value of its product than that of any other industry in the country, but another feature of note is that the largest textile mills in the world are in the United States. They are situated as follows:

The biggest one, producing both cotton and woolen goods, is at Manchester, N. H.; the largest worsted mill is at Lawrence, Mass.; the woolen mill, at Maynard, Mass.; the fine cotton yarn mill, at New Bedford, Mass.; the hosiery mill, at lpswich, Mass.; the worsted yarn mill, at Lawrence, Mass.; cotton cloth weaving mill, Salem, Mass.; cotton mill, Somersworth, N. H.

From the struggles and limited activities in the early days of the country the industry has spread so that it has come to occupy in the aggregate a great expanse of territory. In this connection is included not only the textile mills of the country, numbering more than 9,000, but also the sources of the raw material. One is the extensive cotton fields of the South.

In the beginnings of the Republic, George Washington recognized the advantage of producing the best wool and to that end imported the best Spanish sheep procurable. From that time to recent years the wool industry has advanced so that vast sheep ranges are required for the immense flocks of the Far West. The fields of the Middle West, the hillsides of New England, and to a certain extent the pastures of the South furnish herbage for the wool-bearing animals.

The cotton mills of the United States consume annually nearly eight million bales of cotton—nearly as much as Great Britain, Germany, Russia and France combined consumed before the war. They give employment to more than 500,000 operatives. They operate more than 33,000,000 spindles and 673,000 looms. These figures apply only to the cotton manufacturing industry and do not include the 1,400 woolen and worsted mills which are mostly located in the New England States.

One group of New England mills annually requires 75,000,000 pounds of wool—equivalent to the fleece of 10,000,000 sheep—or twenty-four per cent of the total wool production of the United States. In the same time they use 100,000,000 pounds of cotton. In 1920 the total valuation of their manufactured products amounted to \$150,000,000, upon which they paid \$23,000,000 in taxes to the United States Government.

To illustrate further the magnitude of some of the great textile plants of the country, one group of mills in New England covers 170 acres of floor space for manufacturing purposes alone. Another group extends over fifty-five acres of ground and produces enough worsted cloth every year to make three million suits of clothes—if used for that purpose. One room in another plant covers six acres in itself. A big concern in New Hampshire provides employment for

^{*}Latest authentic figures available at the precent writing from the United States Census of Manufactures.

over 15,000 operatives. It required 63,800 gallons of paint to single-coat the 440 acres of interior walls (2,129,600 square yards)

in this plant.

Of the 622 dyeing, bleaching and finishing mills in the United States, 130 plants each produce every six days one million yards of finished goods. To accomplish this, twelve million gallons of water is required. This water, in each instance, is distributed through more than 100 miles of piping, varying in size from one-eighth of an inch to thirty inches in diameter.

Over \$500,000,000 is annually spent by textile manufacturers in the United States for new mill construction, machinery, equipment and supplies-exclusive of raw mate-

rials.

The total horse power generated by steam in all manufactures in the United States is 11,000,000. Of this the textile industry generates over one-fifth. Enormous quantities of coal are used. One company requires 300,000 tons; another 200,000 tons; a third 180,000 tons, per annum. No other industry uses so much dyestuff—about

\$100,000,000 worth a year.

The textile mills of New England alone use 750,000 barrels of soap annually for scouring and washing. New England's textile mills annually use 19,812,670 gallons of oil and 27,000,000 pounds of sizing. Millions of pounds of starch are annually used. One mill alone in 1920 used over 600,000 pounds. Over \$60,000,000 is annually spent by textile manufacturers for leather belting renewals. This does not include belting for new mills.

The fact has been previously mentioned that some of the inhabitants of the country are more or less dependent upon the textile industry for employment. One-tenth of the entire population, indeed, actually produces yarn and fabrics that can be made into clothing. This does not include knit goods and naturally neither carpets nor

hemp manufactures.

It is not only for home consumption that the mill machinery is busy, but also for interests abroad, including Europe, the Far East, Africa, South America, Australia, and other foreign markets. Many of our tickets or brands are well known in foreign countries. There is a great demand for American goods, compared with that for products of other countries. In the Red Sea district and East Africa, American grey goods are widely sold. In fact, all grey goods sold in those districts, whether they come from this country or not, are known by the natives as "Americani.

In Turkey, "Cabots," the name of a famous old American brand, has come to be a generic term for all American grey goods. This brand became so popular in Turkey about twenty years ago that manufacturers in other countries began to imitate it.

During the World War, this country exported increased amounts of her products to foreign countries, and in this way enlarged

her markets to a great extent.

Several textile schools have been founded in the United States and the enrollment in these schools has reached big figures. Employers value the training which graduates of the schools have obtained and are glad

to engage them.

The early laws, the early account books, and the early diaries and letters all point to the supreme energy and constant thought expended by all of America's prominent men to make the Unites States economically independent and competitive with Europe. To the successful efforts of these men, and likewise the enterprise of those who followed, can be attri-buted the present magnitude of development which the textile industry has reached in the United States. Occasional ill-advised legislation or an unforeseen civic upheaval has reacted on its prosperity, but the textile industry is so woven into the life of the nation, that the industry and the country are mutually protective. Today the outlook is brighter than the rosiest dreams of the pioneer manufacturers, and the horizon shows a vision of world supremacy in textile production.

AMERICAN WOOLEN CO.

One of the marvels of modern industrial organization is the great system of fifty-nine wool manufacturing plants coördinated under the name of the American Woolen Company. The conception and successful accomplishment of this huge venture bears eloquent witness to the daring vision, irresistible energy, and remarkable executive ability of the man who founded the organization and personally directed the work of building the largest wool manufacturing concern in the world. This individual is William M. Wood, president of the Company, whose personal history is largely the very history of the American Woolen Company.

The career of President Wood is a great human-interest story of the poor lad thrust into a struggling world and left to forge his way to the front through sheer ability and intelligent determination. Mr. Wood did not spring from a wealthy family, nor did he have influential friends to map out his boyhood life and to nurse him along as he entered the business world. As a lad he helped bear the family burden by clerking in the counting room of the Wamsutta Mills at New Bedford. The boy was extremely alert. His activities were not confined to the office, but he lost no opportunity to apply his curious attention to the manufacturing processes.

William Wood left the textile business for a while, and tried his hand with a bank in Philadelphia, and finally returned to work with a bank at New Bedford. But the call of the spindle and the loom was not to be denied and a short while later we find him as an assistant in a cotton mill at Fall River.

Mr. Wood had become quite friendly with Frederick Ayer, who at this time acquired ownership of the Washington Mills at Lawrence, Mass. Mr. Wood took a position with the Washington Mills, eventually becoming a traveling salesman on their lines of worsted yarns. He conducted the sale of the mill's products so successfully, that Mr. Ayer appointed him to manage the mill. The young man now had his first real opportunity to exercise his sagacity and resourcefulness as a mill executive. As if by magic he wiped away the heavy indebtedness of the mill.

And now there came a period of dark days—rather years—for the wool manufacturing industry in the United States. The years from 1894 through 1897 comprised the interval during which the Gorman-Wilson tariff was in effect. The American wool industry could not withstand the merciless

competition of goods brought from foreign shores—goods produced under conditions far different from those prevailing in our own land. The weak mills were completely lost in the shuffle; well-organized mills emerged from the havoc in a weakened and staggering condition; and it was only the most skilfully managed companies that survived with a sufficient reserve of capital and optimism to at once set about the work of clearing away the debris and begin to rebuild.

The industry throughout the country was thoroughly disorganized. In addition to the withering effects of unregulated foreign competition, a silent internecine struggle was waging among the American manufacturers. The condition of the wool manufacturing industry was almost exactly that of a routed army whose soldiers were engaging in mutual combat. Mill executives were recklessly competing against each other for labor, raw material, equipment, overseers, and markets. The prevailing unsteadiness of manufacturing conditions, the chaotic upheaval of values in the goods market, the haphazard and recklessly intense but futile merchandising systems-all these actual circumstances bore painful but eloquent evidence to the industrial ravages of unintelligent "cut-throat" competition.

What was to be done? Whither the road which was to lead the industry out of this morass of struggle and ruin? Where was the leader who possessed the courage, the brains, and the boundless persuasive powers indispensable to the accomplishment of this Herculean task? For this was no matter of reorganizing a weakened concern, of building up the production and sales of one company. It was a proposition of reorganizing a whole industry involving millions of dollars invested, thousands of persons employed, and the American public to be provided with wool products.

William M. Wood, still managing the Washington Mills, had an idea which he believed could swing the industry out of the helpless rut. With tireless energy he had made a scientific and practical analysis of production methods and cost. His unshakable belief was that the problem could be solved only by associating a group of mills in a coöperative producing organization and thus reap the benefits of a centralized executive system, coördinated selling and purchasing departments, and technical and research departments of an efficiency far beyond the means of a single mill to maintain.



WILLIAM M. WOOD

In 1899 Mr. Wood succeeded in organizing seventeen New England mills under the name of the American Woolen Company. Volumes of language would perhaps be necessary to describe adequately the trials and skirmishes which characterized the successful accomplishment of this gigantic venture. Mill owner after mill owner had to be interviewed and convinced of the soundness of the plan and of the probability of its success. Discouraged bankers had to be stimulated with renewed confidence. But to use a sporting term, Mr. Wood had "the He used the irresistible argument goods." of actual example, of results already realized in the Washington Mills under his management. With an amazing display of facts and figures, with his extensive first-hand knowledge of wool manufacturing, he showed how he had introduced and profitably maintained practical cost systems; how he had located and stopped leaks of a kind which were beyond even the suspicion of the ordinary mill executive; and how he had reduced overhead expenditures per unit of output.

As great as was the task of organizing the American Woolen Company, the real genius of its founder was displayed in the remarkable growth and development of the enterprice, until today it stands forth as the largest company of its kind in the world. Today the American Woolen Company operates fifty-nine mills and is owned by over 17,000 stockholders, and although the company produces but a fraction of the woolen and worsted goods of the United States, its standards of quality and value have made it a leader in its field. The variety of fabrics produced is almost endless, ranging from the finest and sheerest of dress goods down to the heaviest of blanketing material.

The company today has one of the best working policies in its relations with the thousands of persons in its employ. During the era of rising prices the company organized a coöperative purchasing society through which the member employees could buy supplies for the home at a minimum of cost. Near Andover, Mass., the company is now constructing Shawsheen Village, a model community for the housing of its personnel. Every phase of the present activities of the American Woolen Company, its manufacturing methods, its selling policies, and its relations with labor reflect adherence to the highest standards of economic and social principles, and bear tribute to the prophetic vision and tireless genius of its founder, William M. Wood.

ACKERMAN, FOSTER & PARSONS

The brokerage house of Ackerman & Foster, successors to Ackerman, Foster & Parsons, has a clientele and volume of business which justly entitles them to the excellent standing they have acquired. Ten salesmen are employed on the staff and the range of goods dealt in is broad, including as prominent items, domestic sheeting, sateens, lawns, organdies, and silk and cotton fancies.

Though the partnership of Ackerman, Foster & Parsons dated only from February, 1919, it was a convergence of interests due to preceding events affecting those three partners. Stephen H. Ackerman, the senior partner of that firm, who died September 2, 1920, and was succeeded in the business by his son, was an old acquaintance of the elder generation of textile men in New York. Born on the Island of Guerra sey, he came to America as a lad, adopted the textile profession, and subsequently spent twenty years with Catlin & Company and their predecessors. Then ensued ten years association with Amory, Browne & Company where he had charge of the domestic cotton goods department.

In 1907 Mr. Ackerman entered the brokerage business, establishing the firm of

Ackerman, Bell & Company, with which, later, Hallet J. Foster became associated. The coming of war took away Mr. Foster who served with distinction in the 105th Infantry of the 27th Division throughout its memorable campaign abroad. His return was nearly coincident with the creation of the firm of Ackerman, Foster & Parsons. Mr. Foster had had fine training. At the outset he took a course in the Philadelphia Textile School. After graduation he filled a position as chemist with the Weidmann Silk Dyeing Company of Paterson, N. J., then served successively as a dyer for the Peerless Plush Company and as converter for H. Herman Sternbach.

John Parsons, the third member of Ackerman, Foster & Parsons, who has retired from that firm, was an associate of Mr. Ackerman in Amory, Browne & Co., having been head of the shirting department there. For a time Mr. Parsons had charge of the Pequot Shirt Company's mill at Westerly, R. l. He became connected with the brokerage affairs of Mr. Ackerman a year prior to the beginning of the partnership. The business is conducted at 256

Churc's street, New York City.

AMERICAN MUTUAL LIABILITY INSURANCE CO.

The history of the textile industry can hardly be considered complete without including the story of the development of the American Mutual Liability Insurance Company of Boston.

Since 1887 this company has been recognized as the main source of protection for textile manufacturers, first under the em-

The company's growth has kept step with the textile industry in the United States, and although it has developed a large business in other industries, its largest payrolls and controlling interests remain textile.

Much of the credit for the successful development of this company is due to the



CHARLES E. HODGES

ployer's liability laws, and more recently under the workmen's compensation acts of the various states. Organized by textile men, the first list of policyholders contained such names as the Acushnet Mills Corporation, Appleton Company, Boott Cotton Mills, Central Mills Company, Mason Machine Works, Massachusetts Cotton Mills, Merrimack Manufacturing Company, and Whittenton Manufacturing Company.

sound business judgment of its president, Mr. Charles E. Hodges, who has been connected with the company for more than twenty-five years.

Today the American Mutual is recognized, not only as the largest mutual company, but also as one of the foremost companies of any kind writing these forms of insurance.

BIGELOW-HARTFORD CARPET CO.

The Bigelow-Hartford Carpet Company, a world leader in the wonderful modern methods of carpet production, represents the commercial development of an ancient and fascinating art, the beginnings of which are lost in the dim recesses of history. In America, however, science and industry combined to produce the first powér-made carpet, the year 1839 marking the abandonment of the old hand looms. About the year 1760, occurred the establishment of the original American carpet factory when rag carpets were made in various places, mostly in and

grain loom. What the celebrated Frenchman, Jacquard, had given the weaving industry that accomplished such a revolutionary improvement in the weaving of lighter fabrics was now applied to the heavy carpet texture.

The adoption of the Jacquard attachment was the immediate companion of another epoch-making improvement achieved by the genius of Erastus B. Bigelow, also an employee at the Lowell mill. Bigelow, aided financially by the treasurer of the Company, succeeded in harnessing the power of steam to the loom, supplanting



Weaving Mill of Bigelow-Hartford Carpet

about Philadelphia. Thereafter small hand loom factories flourished for a time and passed away.

The first practical advance made occurred in 1825, when the Lowell Manufacturing Company bought a mill at Medway, Mass., belonging to Alexander Wright, and moved it to the city of Lowell. A simultaneous and related historical development was the founding of another company by Orrin Thompson, which began operations under state charter at Thompsonville in 1825. Seventeen years later this became the Hartford Carpet Company. About that time at the Lowell mill, an inventive workman successfully applied an adaptation of the Jacquard attachment to an in-

the limited strength of human muscles laboriously applied by the unlimited energy from nature's storehouse. His was the first power-driven loom to weave carpet, perfected in 1839. The Hartford Company quickly adopted the Bigelow invention at their Thompsonville and Tariffville mills, and on the strength of it a new factory was established at Clinton, Mass., for the weaving of body Brussels carpet. Then the firm of H. N. and E. B. Bigelow established a new factory at Clinton, Mass., which later became the Bigelow Carpet Company, which in 1899 took over the Lowell Manufacturing Co., consolidating the mills at Clinton and Lowell. Finally, in 1914, a merger was effected between the Hartford and the

Bigelow Companies, their united organizations being represented in the present Bigelow-Hartford Carpet Company.

Erastus B. Bigelow is one of the names of historic significance in the annals of textiling, because he was the father of that instrument of progress, the power loom, and also because he gave impetus to the industry that has become world-famed for

the fruits of that loom.

Ten thousand yards of carpet was the entire output of the American factories in the year of 1810. Scarcely more than a hundred years later the Bigelow-Hartford Company makes approximately 20,000,000 yards of carpet and rugs annually. Their success could never have been won merely upon an aggregation of capital and property, speed or quantity of production. The reason is "quality." Take the wool, for example. That which finds its way to the Bigelow-Hartford Mills travels from remote mountain districts—the Andes, Thibet, the highlands of Scotland, Atabia,

the system of inspection rigidly applied to every yard of carpet at each step of its passage through the succession of processes. When a rug or carpet at last emerges from the factory it is as near perfect as choice material and the skill of man can make it.

The lover of things beautiful, visiting the exhibition rooms at 25 Madison avenue, New York City, will remain to become a rug enthusiast. There he will see the Bigelow Imperial Ispahan Wilton, Bigelow Imperial Ardebil Wilton, Imperial Kabistan Wilton, Electra and Bussorah Axminster, "Hartford Saxony," and a host of other rugs and carpets displaying a wealth of beautiful designs and colorings. A remarkable commendation of Bigelow-Hartford fabrics is their widespread use in hotels. No less than three-fourths of the leading hotels in America are carpeted by the products of this one firm. It is apparent that a carpet could be subjected to no



Mills of Bigelow-Hartford Carpet Company, Thompsonville, Conn.

Persia, Russia, India, and China. It comes in varying grades and qualities, the best from cold countries. An abnormally warm or cold season in some far off place will mark the difference between short and badly matted fleece and the long, straight, strong quality required.

Expert wool men divide the various fibres according to their strength and their dyeing and spinning qualities. Then commence the steps in manufacturing—washing, oiling, combing, spinning, weaving, and finishing, each subdivided into a sequence of stages. In the chemical laboratories everything used in the mills is tested, but particularly the dye stuffs. A characteristic of the Bigelow-Hartford mills is

severer test than to be ceaselessly trodden upon by the throngs at the Commodore, Waldorf-Astoria, Plaza, Ritz-Carlton, Biltmore, Astor and Knickerbocker Hotels in New York, and at similar institutions in every city in the country. As in public places, so in the seclusion of thousands of homes. Three generations of Americans have grown up on floors covered by these fabrics.

The present officers of the Company, upon whom rests the chief responsibility for maintaining exacting standards, are: Robert P. Perkins, president; John F. Norman, vice-president and general manager; Frank H. Deknatel, treasurer; and George S. Squire, secretary.

CLAFLINS INCORPORATED

Claffins Incorporated is an organization, splendidly prepared in merchandise, facilities and experience to satisfy the demands of the retail dealer in textiles in all parts of the world.

Within the last seven years, Claflins has undergone radical changes of management and policy, the wisdom of which is reflected in unprecedented growth and prosperity, based on a foundation that insures a bright future for the business itself and, therefore, a continuance of its benefits to the trade in general. Though the present corporation is only a little more than six years old, the name of Claflin has been a household word

ment. The total valuation of stock available for immediate shipment amounts to millions of dollars. To keep it moving a large force of traveling salesmen tour the country, and they have made the Bontex trademark—originally a brand name for wash goods, but now the mark of the house—a standard of merchandise in town and country.

Each department is in charge of a specialist of seasoned experience and sound judgement.

The facility with which the export trade is conducted and the growth of that department is worthy of special comment. The



Office Building of Claffins Incorporated, New York City.

in textiles for many decades, having grown from a modest enterprise founded in 1843 by Horace B. Classin.

The immense building, occupying the entire block bounded by Worth, Church and Thomas streets and West Broadway, is familiar to thousands of buyers and its interior is one of the sights of the city. Even a non-stop tour of five huge floors, twelve acres in total area, stocked with good, clean merchandise, effectively displayed, consumes a full hour. Row upon row of tables and cases carrying fabrics of many hues and textures, notions and a large fancy goods, meet the visitor's eye.

fancy goods, meet the visitor's eye.

The goods on display are constantly being replenished from the contents of eighteen warehouses in the vicinity so that all lines are kept ready for prompt ship-

trade territory now covered, besides the entire United States and Canada, embraces Europe, South America, the Orient, China, the Levant, and India.

The officers of Claflins Incorporated are all men of action in the textile world; men who have spent their lives helping the industry to grow and have grown themselves in the process. Harry P. Bonties, the president, has a very broad knowledge of textile values. In the great war his services were loaned by Claflins to the government's War Trade Board where his knowledge was availed of as head of the purchasing department in charge of buying woolen and worsted fabrics for the army's equipment.

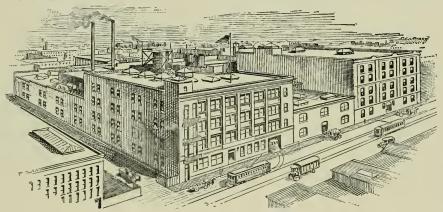
The present position of Claffins Incorporated is strong encouragement to optimistic views of the future.

THE ARABOL MANUFACTURING CO.

From a small beginning in the year 1885, when but half a dozen hands were employed, the business of The Arabol Manufacturing Company has grown so that the annual turnover is now \$2,500,000. The company manufactures adhesives, sizing compounds, softeners, starches, oils, and greases for textile mills. The founder was the late Edward Weingartner. In the year 1888 a corporation was formed, and associated with Mr. Weingartner were Julius Jungbluth and Charles Seitz, who have also since passed away. During their lifetime the business was developed and put on such a sound foundation that it is today an institution which is forging rapidly ahead.

vears to educate those engaged in the textile industry to buy the compounds practically ready for use, as prepared by the Arabol Manufacturing Company. By persistency and practical demonstrations in the textile mills over a period of years, the industry gradually saw the light and the advantages of uniform products such as the company could supply in any quantity.

The business of the company increased as the advantageous qualities of the products commended themselves to the consumer. While the original plant contained less than 10,000 square feet of floor capacity the requirements have developed so that the floors of the Brooklyn plant cover about eight



The Arabol Manufacturing Company

The corporation was named The Arabol Manufacturing Company after one of their principal manufactures at the time it was formed, as substitute for gum arabic and called Gum Arabol. In those days this product, on account of the high prices of gum arabic, was used extensively in making confectionery in which gum arabic was previously used. At that time Gum Arabol was also introduced into the textile industry in order to replace gum arabic.

Besides the manufacture of adhesives of various natures, the company's output, as noted above, includes sizings, softeners, soluble oils and greases for the textile industry. Up to the time these products were put on the market the members of the textile industry had been making their own materials according to their own ideas and their own formulae. It was exceedingly difficult and required constant effort for a period of

Over 200 are employed, mostly Americans, including some of German descent. Another plant in the Middle West has been under construction and this will take care of the business in that section. The company's trade territory is the whole world. The present capitalization is \$450,000. The percentage of increase in the business in recent years has been 100 per cent. This large growth and also the previous prosperity is ascribed by the company to the high quality and uniformity of their products and the service rendered to the trade. The company is also connected with the Amid-Duron Company, manufacturers of emulsifying agents for woolen mills.

The officers of the company are as follows: President, L. M. Weingartner; vicepresident, F. W. Zeimer; treasurer, F. W. Dritter; and secretary, O. R. Seitz. The New York office is at 100 William street.

AVON MILLS CO.

The personality of C. l. Barker, F. H. Packard, C. F. Packard, and A. D. Barker with their honest dealings, reliability and financial stability, has been a potent influence in the successful conduct of the business of the Avon Mills Company at Lewiston, Me. This company was organized by C. l. Barker and E. F. Packard in 1882 and the quality of its product, cotton yarn for the weaving,

was also founder of the Barker Mill in Auburn, Me., otherwise known as the Little Androscoggin Water Power Co. The Avon Mills Company is one of the few textile corporations of Lewiston which is owned locally and does much for the prosperity of the city, inasmuch as both payroll and dividends are spent or invested in Lewiston.

The stock has always been owned entirely



Avon Mills

knitting and wire trade, has brought it to the front rank as one of the most reliable textile mills in the United States. C. l. Barker, the first president, was a pioneer in the textile business in Lewiston, serving as agent of the Bates Manufacturing Company from 1868 to 1888. During this period he was the direct means of establishing the Bates on a firm foundation through his inventive genius and untiring energy. Mr. Barker in the Barker and Packard family and is now all owned by the Packard family, residents of Lewiston. The capitalization is \$110,000 of shares issued. The trade mark of the Company is AvOnA, which is registered.

The present officers of the Avon Mills Company are F. H. Packard, president and treasurer, and C. F. Packard, agent and secretary.

ATLAS COLOR WORKS, INC.

One of the American dyestuff concerns established during the World War is that of the Atlas Color Works, Inc., in the year of 1916, whose plants are located on Gowanus Canal in Brooklyn, and office at 322 Ninth street, Brooklyn, New York.

This concern was incorporated for \$100,-

000, with officers as follows:

Mr. Philip W. Zobel, president; Mr. F. R. Ficken, vice-president; and Mr. Charles W. Zobel, secretary and manager.

In spite of all the difficulties in the manufacture of dyestuffs, this concern was one of the most successful, its annual sales reaching in excess of half a million. The colors manufactured are methylene blue, "Indigotine," indigo extract, chrome yellow, and also large quantities of soluble oil.

Fifty hands are employed of whom the predominating nationality is American.

The directors of the above concern dissolved in 1920 by mutual consent of the corporation. The establishment is now owned by Mr. Philip W. Zobel, with an invested capital of \$500,000, and is doing business under the name of Atlas Color Works with Mr. Charles W. Zobel as the general manager.

CONVERSE & COMPANY

Though incorporated as recently as 1907, the history of Converse & Company extends back by direct succession to the old and respected Philadelphia firm of Coffin & Altemus which was established in the year of 1864. The New York branch of that firm was established in 1877, and was conducted here for many years under the name of Coffin, Altemus & Company. Finally, in 1907, Mr. Everett H. Converse, who had been a partner in Coffin & Altemus for nearly forty years, incorporated and became the first president of Converse & Company.

In the year, 1913, Mr. Converse retired from active participation in the business and Mr. Frederick K. Rupprecht was elected to the presidency, which office he has held ever since. The rapidity of the growth and expansion of the business of Converse & Company is too well known to need comment and is ample testimonial to the ability and foresight of Mr. Rupprecht as the executive driving force of the corporation.

The activities of the Company have broadened out vigorously and in many diverse directions but at the same time have been confined closely to its own special legitimate field. As the selling agents for Kelsey Textile Corporation, a tremendous bleached goods business is carried on under the able supervision of Mr. F. R. Downes and Mr. H. Irwin Moraff, and the fancy white and colored goods under Mr. J. A. E. Stewart. These departments cover a broad field in the converting business. They deal

in bleached cottons, muslins, cambrics, nainsooks, interlinings, shrunks, sheetings, sheets and pillow cases, brown and bleached wide sheetings, pajama checks, fancy white goods, bleached jeans, fancy colored goods, cotton dress goods, and silk and cotton goods.

The mill representative and commission business has, of course, been one of the strongest foundations for the success of the Company. Converse & Company represent between thirty-five and forty of the largest and best known Cotton mills, including among others the recently formed Consolidated Textile Corporation, with its chain of ten excellent mills, and the enormous business of the Windsor Print Works. With this department Mr. John C. Hughes and Mr. Leavelle McCampbell, who had built up a tremendous business of this kind in the last few years under the name of Hughes & McCampbell, Inc., have amalgamated their business and it is all now conducted under their joint supervision. The goods handled by them include grey goods of all descriptions including, ducks, drills, sheetings, sheets, pillow cases, tobacco cloth.

Mr. W. S. Prankard is in charge of the colored goods part of this mill agency business and handles large quantities of chambrays, ginghams, cotton dress goods, outing flannels, denims, etc.

The business of the Windsor Print Works division of Consolidated Textile Corporation is handled under the capable direction of Mr. F. T. Howard, and does an extensive business in printed percales, flannelettes, printed wash goods of all kinds, and the

famous Windsor plisse crepes.

Following the change in ownership of the B. B. & R. Knight mills and other properties in September, 1920, Converse & Company became selling agents for the entire output of these seventeen plants. In terms of cloth manufactured, spindles and looms operated, number of employees, value of property, and reputation of product, the name of B. B. & R. Knight, Inc., either leads outright or holds a high place among the largest American groups of mills. "Fruit of the Loom," the best known Knight trade mark, has been familiar to several generations of housewives as a brand of cotton goods which indicates an unvarying standard of high quality. The Knight plants contain more than 500,000 spindles. are situated throughout Rhode Island and Massachusetts, and employ more than 5,000 workers. The fabrics manufactured are fine sheetings, shirtings, twills, cambrics and high-grade yarns.

The export department, established recently, has shown remarkable progress under the management and supervision of Mr. E. S. Twining, Jr. and Mr. E. H. Downes. This department handles all the lines of the Company in foreign markets, having agents and representatives in the Philippine Islands and all the important cities of South and Central America and

Cuba.

For the purpose of facilitating its customers in all parts of the United States, Converse & Company has increased its export selling force and maintains well organized branch offices in Boston, Philadelphia, Baltimore, Chicago, St. Louis, San Francisco, Minneapolis, Dallas, Atlanta,

Detroit and Cincinnati.

A history of the growth and development of Converse & Company from the few mills represented by it ten years ago and its relatively small number of tickets and brands to the enormous business that is done by it at the present time with brands without number that are known not only throughout this country but abroad, would be interesting, but the scope of this article would hardly permit an enumeration of the steps of its growth. We should not close, however, without a word in regard to the new and handsome quarters into which the Company moved its business in September, 1919. A beautiful mahogany wainscoted salesroom occupies the entire ground floor of Nos. 86-88 Worth street and extends through the entire block to Nos. 7-9 Thomas street. Under this there are a fully equipped and complete sample room, shipping department and storage facilities. From the showroom and executive office a handsome entrance has been cut into the building known as 325 Broadway, on the four floors of which are lodged the export department and financial offices, credit and bookkeeping departments, and other phases of the business including designing room and rest room.

BUTTERWORTH-JUDSON CORP.

The Butterworth-Judson Corporation was organized under the laws of the State of New York on December 27, 1915, with an authorized capital stock of 25,000 shares of preferred stock and 100,000 shares of common stock, of which 25,000 shares are reserved to retire the preferred. The common stock has no par value. The Corporation was organized as a holding company, having acquired control of all the stock of the Butterworth-Judson Company, organized under the laws of New Jersey on December 1, 1901; the American Synthetic Dyes Incorporated, organized under the laws of Virginia on June 4, 1915; and also acquired all of the stock of the Commonwealth Chemical Company, having its plant in Boston. On January 1, 1917, the Corporation assumed all the assets and liability.

with buildings devoted to the various commodities produced. During the war the Newark plant employed from four to five thousand men but later it greatly reduced this number so that after the armistice there were employed in the neighborhood of one thousand men. For eighteen months prior to the declaration of the armistice the corporation devoted a great deal of time and capital to the establishment of a dye manufacturing industry. It is now devoting its time to the producing of dyes and dye-intermediates and chemicals in substantial quantities.

Following the cessation of the war and the consequent change from the manufacture of picric acid and ammonium picrate, the dye improvements progressed rapidly. The company is now producing a number of



Plant of Butterworth-Judson Corporation

ties of the above mentioned companies and became the operating company.

The principle business from January 1, 1916, to the end of the War was the producing of picric acid for the British, French and Russian Governments, and ammonium picrate for the United States Government. At least ninety-five per cent of the producing capacity of the various plants was devoted to the production of this war material.

During this period the company manufactured and shipped to Europe approximately 75,000,000 lbs. of pictic acid and ammonium picrate, both of which were used for the loading of large calibre shells. In addition they also manufactured and sold large quantities of sulphuric and nitric acids.

The main plant of the corporation is situated on the banks of the Passaic River at Newark, N. J., and consists of about eighty acres of land which are practically covered

basic, chrome and acid colors. The silk and woolen dyes are receiving special attention and in a short time a line of cotton dyes will be placed on the market.

The Corporation has acquired seventy-five per cent of the stock of the Columbus Crystal Company, which is located at Newark, N. J., manufacturing Glauber salts and other heavy chemicals.

The principal office of the Corporation is located at 61 Broadway, New York, N. Y. The present officers are: William A. Bradford, president; Geo. A. MacIntosh, vice-president; M. F. Chase, vice-president; H. G. Atha, comptroller; and G. V. O'Brien, treasurer. The board of directors consists of seven members, as follows: William A. Bradford, T. L. Chadbourne, Leroy W. Baldwin, Stephen B. Fleming, John J. Watson, Jr., Walter H. Aldridge, and March F. Chase.

BALLARD VALE MILLS

February 25, 1836, John Marland, Abraham J. Gould, and Mark H. Newman, their successors and assigns, were made a manufacturing corporation by name of the Ballard Vale Company, for the manufacture of cotton and woolen goods, the whole capital stock not to exceed \$64,000.

The mill privilege and property was purchased from Timothy Ballard, after whom they named the village. In the mill built at this time the fine woolen yarns used in the manufacture of white flannels were made by double spinning, the first time this process

had been used in the United States.

In 1841 the capital stock was increased to \$100,000. In 1842 Charles Barnes, of North Andover, went to England to purchase worsted machinery. The following year, the first piece of worsted goods made in the United States was manufactured at this mill. In 1844 the wooden mill was built, designed to be used exclusively for the manufacture of worsted goods, the capital stock increased the next year to \$200,000.

John L. Hayes, in his report on wool fabrics at the Centennial Exposition, Philadelphia, in 1876, makes the following state-

ment:

"The first attempt to fabricate delaines in the United States was made in a mill at Ballard Vale, in the town of Andover and State of Massachusetts, about 1844, by John Marland, agent of the company. It is worthy of note as illustrating how naturally and by direct descent the new industry arose and spread, that the mill at Ballard Vale had been organized to make fine flannels, being the first to fabricate flannels in the country. The transition was natural to delaines, which, as first made, had much of a

flannel character. About 1844, this establishment imported worsted machinery from England, and made some delaines for printing and others for dyeing. They introduced hand combers, and made their own warps. The wools for the printed delaines were all combed by hand. The goods were first printed by blocks at North Andover, and afterwards on the machines of the Hamilton Manufacturing Company at Lowell. The fabrication was very successful, although the goods were inferior to those now made. The principal difficulty encountered was that of introducing the fabrics into the American market; which was accomplished only by simulating foreign marks and disguising the boxes to conceal the domestic source." business of manufacturing worsted goods in connection with the making of fine flannels was conducted by the Ballard Vale Company from 1843 to 1850, when the worsted mill was leased to Jeremiah S. Young, under whose management it remained until 1853, when this branch of the business and most of the skilled help were transferred by him to the Pacific Mills at Lawrence. Mr. Young was the first treasurer of the Pacific Mills and constructor of its works, also a brotherin-law of John Marland, and had gained his practical experience at Ballard Vale.

After the discontinuance of the manufacture of worsted goods, both mills were used in making flannels and this Company gained a reputation second to none in the world, for the quality of its product, a reputation held to this day, the Massachusetts Board of World's Fair Managers, Chicago, 1893, in their report stating: "The product of this mill stands easily first among the mills of the United States in fineness and elegance of its manufacture of flannels, both where wool

alone is used, and where silk is used in the warp. Their superior is not to be found in this or in any foreign country. They had a record at the Philadelphia Exposition for great perfection of fabrication, and the international reputation there gained was not

lost at the Chicago Exposition.

The credit of this enviable record is due to Captain J. Putnam Bradlee, who was connected with the mill for a period of nearly fifty years. His life was identified with the history of this Company from its earliest days. He was one of the early directors, then served as treasurer from January 15, 1842, through all the changes and various phases of its history, until he became sole proprietor in 1866. The secret of his success lay in the persistency of his purpose, indomitable will, high sense of honor, hatred of shams, and business capacity to organize the factors, increase their product, and maintain their high standard.

In the language of another: "Captain Bradlee was no common man. He was of that race of large and strong men to which the Lowells, the Lawrences, and the Appletons belonged, who, by their genius working not in the line of politics, but in equally useful but less conspicuous ways, have largely contributed to the building-up of this Commonwealth to the position which she now holds before the world. He was among the

last of his kind."

A remarkable fact in connection with the Ballard Vale Mills is the long terms of service of many of its employees, something unknown in most American factories. The average term of service, omitting the young people, is not less than twenty-five years. The relations between capital and labor in this mill have always been pleasant, a strike not having been known to occur in the

eighty-five years of its existence. Captain Bradlee was not only mindful of the interests of his employees by being just in all his pecuniary relations with them, but he was mindful of their social well-being by acts of disinterested generosity. He furnished many of their supplies at cost, established a public library for the use of the village, opened places of amusement for their leisure hours and maintained an excellent course of lectures and concerts each winter, admission to

which was free.

Captain Bradlee died February 2, 1887, leaving over a million dollars to N. J. Bradlee, who died December, 1888. William L. Strong, and William H. Hodgkins, in trust, for the benefit of his sister, Miss Helen C. Bradlee, of Boston, and at her death to such charitable institutions of a public nature in Massachusetts, non-sectarian in character or purpose, as she might designate. Since the death of Captain Bradlee, Miss Bradlee continued until her death all the benefactions introduced by her brother, also pensioning a number of employees who by reason of age or other infirmities had been incapacitated from working and distributing a large portion of her income among the leading charitable institutions of the state and by directions to the Trustees distributed the principal to various charitable institutions in the state.

The business was carried on by the Trustees of Captain Bradlee's Estate until early in 1905 when the mills were sold to a corporation since known as the Ballard Vale

Mills Company

Howell F. Wilson became treasurer of this company four months after its organization and has continued in that capacity since. Mr. Wilson went to the Ballard Vale Mills in December, 1877, and had his early training under Captain Bradlee.

BANNER SILK KNITTING MILLS, INC.

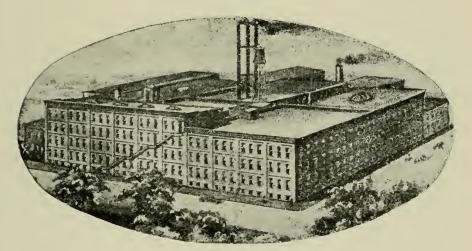
Specializing in a staple commodity, knitted fabrics, and aiming at a trade territory extending into all parts of the world, there was organized on August 1, 1919, by a group of progressive and wide-awake men the Banner Silk Knitting Mills, Inc., with headquarters and salesrooms at 404 Fourth avenue, New York City. The speed with which this Company has moved ahead is illustrated in the fame of its "Radiaknit" fabrics, widely advertised as "The perfect knitted fabric, a creation, not an imitation."

"Radiaknit" today is known everywhere, and its originators and manufacturers have done so amazingly well in the brief period of their corporate partnership that they can figure on an annual turnover appreciably in excess of \$4,000,000. This is the more remarkable when it is considered that the capitalization involved is \$500,000, which, though substantial enough, is much less than that of many another organization which has been unable to produce such telling results in so short a space of time.

There are good and sufficient reasons for the growing success of the Banner Company. Entering a field of large possibilities when they commenced the manufacture and sale of knitted fabrics and knitted novelties, with artificial silk as the basic material, they wrote down for themselves a set of rules. Not the least important of these was that rule above all others—the Golden Rule. They believed that the wholesome old precept, "Do unto others as you would have them do unto you", had its place in business quite as much as anywhere else, and they believe it now.

This is just one of the reasons why they are making a go of it. Among the others is their faith in the power of publicity. They talk to the trade through the medium of the trade publications and to the great buying public through the medium of printed advertisements and their "Radiaknit" electrically illuminated signs. Such is their confidence in their goods that they have no fear, metaphorically speaking, of shouting their wares from the housetops, which, it will be admitted, is a praiseworthy business virtue.

The Banner people have their mills in Brooklyn, with ideal shipping facilities and easy accessibility for labor. Their 250 employees in the great Brooklyn mills represent many nationalities, and are selected with the most painstaking care, as befits an organization that has adopted for its trademark, "The Banner Leads". The founders of the Banner Silk Knitting Company were Messrs. Edmund Fain, president; Louis Klausner, secretary; and Emanuel Goldstein, treasurer. They are surrounded by a capable corps of willing workers in the New York headquarters. The Company has branch offices in various European centers.



Plant of Banner Silk Knitting Mills, Inc.

KAUMAGRAPH CO.

A TRADEMARK VISION THAT CAME TRUE

To found a business on the sales possibilities of ten or fifteen years hence, indicates a vision which not every business house can boast of. And to realize that vision to its fullest extent, is indeed a praiseworthy circumstance.

Back in 1903, when goods were goods and silks were silks: back in the days when the "let the buyer beware" policy of merchandising prevailed, and the manufacturer didn't give a hoot whether the ultimate consumer knew him or not; back in the days when you ran your own chances of getting cheated when you bought a suit of clothes, a company was formed by a group of men who knew that some day not far distant these unsatisfactory merchandising conditions would give way to a more broadly conceived policy wherein the manufacturer would figuratively shake hands with the consumer, put his trademark on his goods and say: "Mr. Consumer, we're proud of the goods we make. It is worthy of our name. Our word backs the goods that bears our trademark.

Some pioneers were already on the market. Onyx hosiery had already started on the first leg of the journey to popular success. But taken by and large, few manufacturers advertised their wares, much less put their

trademark upon them.

Such a condition would hardly seem propitious for the formation of a company presenting a better way for affixing trademarks on hosiery, underwear, woolens, worsteds, cottons, silks, and garments; especially when there already were several methods in use, satisfactory enough perhaps for those dayssuch methods as the rubber stamp or the wet transfer.

Yet the little group of men referred to above had the foresight to see that ere long, merchandising methods would change; and manufacturers realize the good-will accruing from introducing themselves to their ultimate consumer through a trademark on the goods. So a company was started to make Kaumagraph Dry Transfers, and two years later in 1905, it was incorporated under the name of the Kaumagraph Company.

Kaumagraph Dry Transfers, or K. D. T's. as they are called for short, enable a manufacturer to put his trademark on his goods in

any color, including gold, with the assurance that it will make a clean, imposing impression, unblurred and beautiful.

But the greater beauty made possible by Kaumagraph Dry Transfers is only one of their advantages, for they are as economical

to use as they are beautifying.

They are economical in initial cost and save money in application as well. In a short time a girl can acquire skill and speed in applying them and affix them from three to ten times faster than by any other method.

More recently an attachment to textile machinery has been devised which affixes Kaumagraph Dry Transfers by machine without any additional operations, simply stamping the trademark along the selvage of the goods or elsewhere as it passes through at the rate of from forty to fifty yards a min-

Kaumagraph Dry Transfers are used in a number of ways and for a variety of purposes. Hosiery manufacturers prefer them because once applied they cannot be retransferred. Indeed they provide a solution to the problem of preventing unscrupulous dealers from changing the marks, as some have done with "stickers." Textile mills are using Kaumagraph Dry Transfers to affix their trademarks as an indication of faith and to build good-will for their products. Silk mills are using Kaumagraph Dry Transfers as trademarks along the selvage. And dyers have found in Kaumagraph Dry Transfers their salvation in ending claims and disputes pertaining to shortage—they are using K. D. T.'s for end-stamping and counteracting claims once and for all.

The officers of the Kaumagraph Co. are: Hugh R. Monro, president; Jos. A. Richards, vice-president; Frank H. Marston, treasurer; and Trowbridge Marston, secre-

Their main offices at 209-219 West Thirtyeighth street, New York, and branches in Boston, Philadelphia, Chicago, Hamilton, Ont , Paris, Buenos Aires, and Montevideo are handling the largest volume of business in the Company's history; but the Company is prepared to serve a number of additional textile mills in the proper presentation of their trademarks to the public.

JAMES E. MITCHELL CO.

One of the leading yarn houses of America is that of James E. Mitchell & Company with offices in the hearts of two great textile cities, Philadelphia and Boston. The officers of this Company are James E. Mitchell, president; John J. Mitchell, Jr., treasurer; and James A. Hayes, Jr., secretary and assistant treasurer. The capitaliza-

tion of the Company at the present time is \$600,000 and the principal products in which they deal are cotton yarns, combed, carded and mercerized, also frame and mule spun in all counts and twists.

The Philadelphia offices are located at 122-124 Chestnut street and those of Bos-

ton at 185 Summer street.

BELL. HUSSEY & BROWN

The firm of Bell, Hussey & Brown is composed of the following members: Amos S. Bell, George Hussey and Frederick R. Brown, Mr. Bell being the senior member.

Mr. Bell started in the cotton goods business as a boy, with the firm of Taylor & Kissel, converters. When this firm was dissolved by the retirement of Mr. Kissel, he went with the commission house of Upham, Tucker & Company, which became Dana Tucker & Company and was later succeeded by the present firm of Amory, Browne & Company. Mr. Bell left the commission house and went with Messrs. Wise Brothers of Baltimore, Md., and New York, and was with them for several years. He returned to the house of Amory, Browne & Company but later left them to form the cotton cloth brokerage firm of Ackerman, Bell & Company.

Ackerman, Bell & Company was succeeded in 1916 by Bell & Hussey, and in

1917 by Bell, Hussey & Brown.

Mr. Bell's experience with cotton goods has been a wide one. He knows the business in all its branches from the loom to the consumer—at the cloth mill, designing, converting, making up into garments, etc.

Mr. Hussey comes from an old New Bedford family who have always been interested in cotton mills. He left the Booth Manufacturing Company to come with Ackerman, Bell & Company. Mr. Hussey gained a wide experience on cotton goods during the war, serving on the Council of National Defense and afterwards being on the purchasing board with rank of captain, in which capacity he bought cotton cloth for the army.

Mr. Brown's early training was gained with the banking house of Kidder, Peabody & Company of Boston, Mass. When they acquired control of the Gosnold Mills, New Bedford, Mass., he was made clerk and while there took a course at the New Bedford Textile School. He became cotton buyer in addition to his other duties.

He left the Gosnold Mills to organize and build the Booth Mill of New Bedford, Mass., and was made treasurer of that mill. Under his management it became very successful, making fine goods of exclusive designs. He is recognized as an expert in styles.

The principal business of Bell, Hussey & Brown is on fine goods, all cottons, and cottons and silks, both plain and fancy. They also handle carded yarn fabrics. Their offices are at 43 Leonard street, New York City.

BRIGHTON MILLS

New Jersey is one of the prominent textile states of the Union and the Brighton Mills of Passaic and Allwood is one of the important concerns in that state, having an authorized capitalization of \$14,000,000 and a history of forty-two years of growth and prosperity. New Jersey is a home of textiles and the Brighton Mills are the home of their special tire fabrics which are purchased throughout the United States and in some foreign coutries and have wide use among manufacturers of tires. Although specializing in tire fabrics, the plant also manufactures Sea Island and Egyptian yarns.

The concern was established in 1879 by James and William Lyall, of New York City and reincorporated in 1900 under New Jersey laws with the capital of \$14,000,000, previously mentioned, of which \$6,000,000 is cumulative preferred and \$8,000,000 common. Of this capital there is issued and outstanding \$2,469,000 preferred and \$4.

126,530 common.

Dividends in recent years have been paid

as follows:

On the preferred stock, in 1912, eight and three-quarters per cent; 1913 to 1916 inclusive, seven per cent; 1917, eight and three-quarters per cent; 1918 and 1919,

seven per cent.

On the common stock, two per cent was paid in 1905; five per cent in 1906 and 1907; four and one-half per cent in 1908; fourteen per cent in 1909; twenty per cent in 1910; sixteen per cent in 1911; twelve per cent in 1912; eight per cent in 1913; six per cent in 1914 to 1916; twelve per cent and four per cent extra in 1917; six per cent and four per cent extra in 1918;

eight per cent and four per cent extra in 1919; and six per cent in 1920. In connection with the dividends paid in 1917 it should be explained that on December 31, 1917, dividends of one and one-quarter per cent were paid on the preferred and five per cent on the common. These were caused be a change in date of dividend payment from the first day of each quarter to the last day of each quarter, which made the January 1, 1918, dividend, under the old arrangement, payable December 31, 1917. The Company has no bonded debt.

About 1950 employees operate the mill. The equipment includes 108 cards, thirty-two combs, 590 looms, 22,960 ring spindles, and 34,240 ring twisting spindles. The concern sells its product direct, through

its general office at Passaic, N. J.

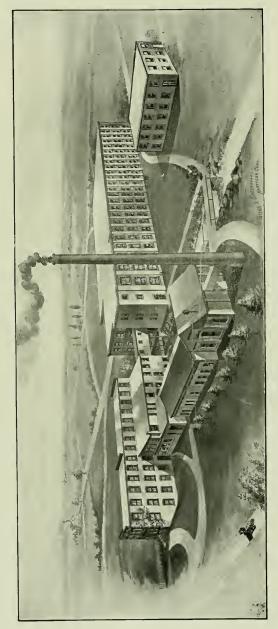
They are the originators of cotton fabric for use in pneumatic tires, having made the first experimental Sea Island bicycle tire fabric 1892. Since then they have been in constant contact with the development of tires and tire fabric from the bicycle days to the automobile cord tire, having a new unit specially laid out with all latest ideas for manufacture of cord tire fabric.

The officers are as follows: President and treasurer, William L. Lyall, the son of William Lyall, one of the founders of the business; assistant treasurer, George Geekie; secretary, Thomas M. Gardner; vice-president and factory manager, T. J. Kelly; and

purchasing agent, E. H. Sedgwick.

Directors: Wm. L. Lyall, Passaic, N. J.; T. J. Kelly, Passaic, N. J.; H. J. Lyall and P. V. R. Van Wyck, both of Summit, N. J.;

and P. S. Young, Newark, N. J.



CHAS. W. HOUSE & SONS FELT MANUFACTURERS, UNIONVILLE, CONN.

The name of House is the oldest in the "Woven" felt industry in the United States and stands first and foremost for quality goods. On this policy the firm has built its inmense industry, and covers the field in its line of all felts with the single exception of paper makers' felts. The firm completes the entire process of felt making in its own mills.

L. F. HUG & CO.

Taking up the business where Hug, Flagler & Co., of New York, had left off in December, 1918, Ludwig Francis Hug and Frederick Davenport Moore had an auspicious start, due to two distinct points of advantage. These were the reputation for honesty and straight-forward dealing which the old house had enjoyed in the textile industry and the score of years of experience which both Mr. Hug and Mr. Moore had had in that same field. Moreover, the two partners had long been associated with Hug, Flagler & Co., whom they were succeeding under the firm name of L. F. Hug & Co., agents for woolen and worsted mills located in various parts of the country and specialists in cotton warp and carded fabrics for men's and women's wear, making fabrics chiefly for moderately priced clothing.

Holding fast to their prized inheritance of integrity, the partners, both native Americans, as were their predecessors, put their shoulders to the wheel, and in a very short time began to make a reputation in their line

on their own account.

Ludwig Francis Hug was associated with Hug, Flagler & Co., George H. Frieze & Co., Frieze, Cone & Co., and Whittemore & Frieze for eighteen years, virtually from the time of the origin of the present business of L. F. Hug & Co. Previously he had been with H. Bauendahl & Co. He counts among his friends and associates a great many of the leading woolen and clothing merchants of the United States, Canada and Europe.

Frederick Davenport Moore was associated with Hug, Flagler & Co., for six years and previously was with the Beekman Remington people for eighteen years. He commenced his successful business career in 1892 with Catlin & Co., one of the pioneer woolen commission houses, which represented some of the most prominent mills in the United States, including the Washington Mills.

The originators of this firm were Mr. Edward A. Whittemore and Mr. George H. Frieze, who formed a partnership in 1898, having previously been connected with Levett, Mitchell & Co., and William L. Strong & Co. Their enterprise struck a winning gait almost from the first, and it was through their instrumentality that great prosperity came to many mills in the East.

Edward A. Whittemore, who died in the fall of 1906, was the son of M. Whittemore, of Whittemore, Peet Post & Co., pioneer woolen and dry goods merchants of a decade ago, and was a close friend of William H. Mackintosh, who was identified with H. P. McKenney & Co., from 1843 to 1911, when he died at the age of eighty-nine.



EDWARD A. WHITTEMORE

Mr. George H Frieze was the son of Mr. Lyman B. Frieze, who for a great many years was the treasurer and manager of The Cranston Print Works Co., of Cranston, R. I. He died July 23, 1914.

Both Mr. George H. Frieze and Mr. Edward A. Whittemore were active in the textile industry to the end of their lives. Men of keen business sense, their word was their bond and they were held in high esteem by all with whom they came in contact.

Thus the story of L. F. Hug & Co., when traced back to its source and followed along through the years to date is one that does credit to the industry of which the firm is a part. Customers find it is a pleasure to transact business with this forward going and four-square house at 45 East Seventeenth street.

CURRAN AND BARRY

In a work of this character—a History of American Textiles—mention should be made of the firm of Curran and Barry, located at 70 Worth street, New Yor.s City.

The firm was established in 1903 by its present members, James M. Curran and B. J. Barry, and for more than seventeen years they have conducted a most conservative business, void of display, that reaches into

the highest figures in their line, and which trade extends throughout the world.

The firm has direct connection with one of the largest dry goods concerns in America, the reputation of which is world-wide.

The specialties dealt in by the house of Curran & Barry are regular and special construction of cotton fabrics, single filling and double filling, army ducks, hose and belting ducks, drills and selected osnaburgs.

DICKS, DAVID CO.

From a small plant at Waverly, New Jersey, producing only 400 pounds of their products per week, to one whose output is between one and one-half and two million dollars per year, the Dicks David Company. manufacturers of dyestuffs, has grown since May, 1916, to be one of the largest companies engaged in this vastly important department of the textile industry. At their plant at Chicago Heights, Illinois, they manufacture an extensive line of acid and basic dyes. Their specialties are malachite green, methyl violet, fuchsine, alkali blues, soluble

blues and metanil yellow.

The prestige which Dicks David Company has won is due to a very carefully selected organization. From the beginning this company has given very careful consideration to such questions as chemical proficiency in its laboratory personnel. In 1920, when a semblance of order had been restored to France, following the war, Mr. R. P. Dicks. the president of the Dicks David Company. went to that country, regarded as the home of the greatest originators of chemical ideas and procedure, and brought back secrets of the highest value, having entered into an arrangement with three of the most noted chemists of France, who are connected with the Sorbonne University. This coup placed in the hands of the American manufacturing company the discoveries and applied processes which these experts had developed and the right to those which they might develop in the future. Likewise it enabled Mr. Dicks to bring to America young men of France who had been especially trained under these scientists. In connection with the latter arrangement, the Dicks David Company agreed to send to France at intervals, mutually decided upon, young American chemists in order that they might receive instruction at first hand from the Sorbonne University

When in 1914, the World War began, this country was largely dependent upon Germany for the supply of chemicals and dyestuffs, and later when the United States was drawn into the fray, the conditions in the dvestuff trade were chaotic. Supplies were shut off, and stocks were depleted to almost nothing. It was during this crisis that the Dicks David Company was one of the pioneers of the industry, to do its bit toward the country's needs. "Necessity is the mother of invention," and it was then that this company outlined its policy to concentrate on each and every color until it was perfected and equalled, if not surpassed, the pre-war German dyes. Continued effort and persistence were duly awarded as the company has succeeded in many instances in producing a product superior to that of

German manufacture.

There have been other factors besides those mentioned entering into the success of this American company. Concentration on certain specialized colors has done much toward the reaping of rich rewards, and organization policy has also contributed its full share. From Mr. Dicks, the president, and Albert David, the vice-president and treasurer, on down the list of executives, the constant aim of the company is to cultivate a spirit of personal responsibility in the ranks. It is the spirit that pervades, both in the plant in Chicago Heights and the offices, laboratories and shipping department in the building at Varick and North Moore streets, New York City.

Plans were under way early in 1920 to make the latter an ideal headquarters for the research and business departments of the company. The expansion of the business received added impetus when in September, 1920, the Dicks David people purchased the interests of B. Heller & Company, whose Chicago property they had acquired in the fall of 1917 under the name of The

Dicks David & Heller Company.

The New York headquarters of the Dicks David Company is at Varick and North Moore streets. They have offices in Pater-son, N. J., San Francisco, Calif., Glens Falls, N. Y., Marseilles, France, Shanghai, China, and Paris, France. They are the distributors in the United States and the Far East for Fabriche Italiane Materie Coloranti

Bonelli of Milan, Italy,

SIGMUND EISNER CO.

The most notable service of recent memory performed by the Sigmund Eisner Company devolved upon it under the stress of war's necessities. During the world conflict the Allied and American armies in turn looked to this the world's greatest makers of uniforms for a huge portion of their supplies.

The scale upon which the manufacture of uniforms was conducted here in America



SIGMUND EISNER

surpassed any previous accomplishment in the specialized production of clothing. Eighteen Eisner plants, situated at different points in New Jersey, delivered uniforms to the number of 50,000 per day, the largest individually contributed quantity and one which was further augmented by other manufacturers.

Before this country entered the ranks of the combatants, the Sigmund Eisner Company were filling contracts for the British, Belgian, and Italian armies. In the last year and a half of the war their full capacity was taxed to equip the outflowing divisions of America's new soldiery. Uncle Sam does not stint his fighters in the matter of their bodily needs, either as to quantity or quality of apparel. Their uniforms made Yankee troops a reputation. Like the wearers, smartness and tough wearing endurance were the conspicuous qualities. Thus the Sigmund Eisner Company had a high standard to meet and that they met it says all that could be said in acknowledging credit.

The principal plant is at Red Bank, N. J., covering several acres of ground and employing two thousand workers. The manner in which affairs are administered within this industrial family reflects the personality of the man at its head. A social service department promotes the comfort and welfare of the employees, individually and collectively, maintaining, among other services, a restaurant and cafeteria, and a recreation hall. What is true of the Red Bank plant also applies to others, such as those at South Amboy, Freehold, Newark, and Long Branch, N. J. The company have at all times been the leading makers of uniforms, and their supply to the domestic market is supplemented by exports to Central and South America. They are the official outfitters of the Boy Scouts of America.

Sigmund Eisner came to the United States from Bohemia where he was born in 1859. His chief asset as a young man was the talent of making his own opportunity and constantly improving it. He established himself in the business of making summer clothing in 1888. It was an unpretentious start but from it has come an industry of national importance. Mr. Eisner is altruistic in his ideals and has given them vent in a quiet but effective way. He is governor of the Jamesburg State Home for Boys, a vice-president of the State Charities Aid Associations, and is active in other similar endeavors. The Sigmund Eisner Company was incorporated in 1916 with Sigmund Eisner as president; H. Raymond Eisner, vice-president; J. Lester Eisner, treasurer; and Monroe Eisner, secretary. The New York offices are at 126 Fifth avenue.

EMERY & BEERS CO., INC.

One of the textile successes of the past quarter of a century is "Onyx" silk hosiery, which has attained the unique distinction of a world-wide reputation, being familiar to wearers of hosiery in every quarter of the globe. Back of every success is a strong personality. Some man of marked ability is mainly responsible for the growth, stability, character and policy of every business. Such a man is Joseph H. Emery, president of Emery & Beers Company, Inc., of New York, who are the distributors of "Onyx". Born in Dover, New Hampshire, of English ancestors who came from Romney, England, and setled in Newbury, Mass., in 1635, Mr. Emery came to New York as a country lad, August 15, 1878, and entered the employ of Lord & Taylor as a stock clerk. He worked up through the various positions of travelling salesman, department manager and secretary, upon incorporation of the firm finally becoming president of that old and well-known concern, July 12, 1916. During this time he developed the wholesale business from an output of \$320,-000 yearly to over \$15,000,000, incidentally moving the lowly hosiery business into a position of the first rank and finally reorganizing and taking sole possession of the wholesale business under the name of Emery & Beers Company, Inc., with offices and salesrooms at Broadway and Twentyfourth street.

The sterling qualities inherited from Mr. Emery's Puritan ancestry included a tremendous capacity for work, initiative and aptitude for detail and organization, together with an ability to forecast the future and the faculty of judging the character and ability of men, which enabled him to surround himself with a reliable staff of assistants to

carry his plans to absolute success. Not content with the demands made upon him in developing "Onyx" Mr. Emery has found time to devote to the business, financial and



JOSEPH H. EMERY

civic interests of the country and his adopted city. He is a member of the Chamber of Commerce of the United States of America, the Chamber of Commerce of New York City, the Merchants' Association of New York and the Union League Club. He is also interested in other commercial concerns and is on the board of directors of several banks.

THE SANFORD MILLS

L. C. CHASE & CO., Selling Agents

A volume of well-filled pages would be required to give in detail the history of the Sanford Mills, which transformed the Sanford, Maine, of 1867 into the thriving industrial center of today.

The actual conversion of this rustic farming village, composed of thirty dwellings and a corner grocery, into the important commercial and manufacturing Sanford of the present, had its beginning in the summer of 1867, when Thomas Goodall came there from Troy, New Hampshire.

of dollars, and provide employment for over three thousand operatives, many of whom own their own homes.

In 1873 Lucius C. Chase of Boston and Louis B., George B., and Ernest M. Goodall, together with Amos Garnsey, formed a partnership and began the manufacture of plain and fancy blankets.

On October 1, 1881, George B., Louis B., and Ernest M. Goodall organized the firm of Goodall Brothers and began the manufacture of mohair velvets for car and furniture.

Plant of Sanford Mills, Sanford, Me. Depts. A, B, and C





Plant of Sanford Mills, Reading, Mass., Dept. L

There he had previously been engaged in the production of horse blankets for the army and navy. He purchased from William Miller and James O. Clark the flannel factory of the former, and grist-mill and saw-mill of the latter, together with the entire water privilege of the Mousam River at this point.

Mr. Goodall began immediately the enlargement of the property, and early in the following year, had two sets of cards and ten looms in motion, the entire plant, at that time giving employment to fifty operatives, in the production of carriage robes and Kersey blankets. These carriage robes were the very first of the kind to be manufactured in the United States.

The products of his plant—the Sanford Mills—finding a ready market, with an ever increasing demand, further enlargements became necessary for the accommodation of constantly augmented manufacturing facilities, until today, the Sanford Mills turn out an annual product valued at several millions

and mohair carriage robes, the very first of each of these fabrics to be produced on this side of the Atlantic. Their venture in this new field proved eminently successful, and on April 4, 1885, the plush business of Goodall Brothers, and the blanket business of Goodall & Garnsey at the Mousam River Mills, were consolidated with the Sanford Mills, founded by Thomas Goodall.

When running at their fullest capacity, the mills of Sanford consume more mohair than all other mills in the United States combined.

The luxurious mohair upholstery, known as Chase Velmo, and formerly called Chase Mohair Velvet, is made by the Sanford Mills at Sanford, Maine. Other products of the Sanford Mills are plush and wool robes for motor cars and carriages, steamer rugs, car plushes, and fur reproductions.

The Sanford Mills comprise a group of large mills which are constantly being added to. This year especially, construction of new mill buildings is greatly increasing the mill

capacity.

There is another thriving group of Sanford Mills at Reading, Mass. Here is produced Leatherwove, one of America's formost upholstery materials for furniture, motor car and boat. Only the best grades are made for those purposes, while other lighter grades are sold for trunks, wall coverings, shoe findings, book bindings, novelties, belts.

This type of upholstery material is growing popular year by year. The days of economy have tended to increase the output tremendously.

The exclusive selling agents for the Sanford Mills of Sanford, Maine and Reading, Mass., are L. C. Chase & Company, Boston, New York, Chicago, Detroit, San Francisco

HOLYOKE PLUSH CO.

L. C. CHASE & CO., Selling Agents

The Holyoke Plush Mills for a number of years previous to 1899 had been engaged in



Holyoke Plush Company

the manufacture of plush fabrics, but in a small, inconsequential way under the name of the Chadwick Plush Company.

Under the guiding hands of the widely experienced mill men who were instrumental in developing the Sanford Mills, the Holyoke Plush Company mills began to progress in a noticeable manner. Increased demand for

Holyoke Plush Company mills products made new additional mill buildings neces-



Troy Blanket Mills

sary, until today the Holyoke Plush Company mills occupy an enviable position.

The products of the Holyoke Plush Company mills—plush robes, robe linings, pile fabrics for cloakings, and glove velours—are sold exclusively through L. C. Chase & Company, Boston, New York, Chicago, Detroit, and San Francisco.

TROY BLANKET MILLS

L. C. CHASE & CO., Selling Agents

In 1851 Thomas Goodall came to Troy and commenced the manufacture of a low grade of beavers and satinets. About 1857 Mr. Goodall conceived the idea of making horse blankets from the cloth which he was manufacturing. This resulted in the first ready-made horse blankets to be distributed in this country. They were sold in bales and not individually as heretofore.

and not individually as heretofore.

About November, 1865, the Troy Blanket Mills were formed by J. H. Elliott, R. H. Porter and Barrett Ripley who purchased from Mr. Goodall all of the mills and machinery. At that time, the mill contained two sets of cards, two hand jacks, nine looms and two sewing machines. The present brick mill was erected in 1869, enlarged in 1877, and in 1880 to a ten-set mill.

Additions were made at various times to the mill until 1898 when an entirely new plant, called Mill B, was constructed. This condition existed until the fall of 1919 when the present mill and power plant were constructed. In this new plant the additions of the various years have all been consolidated into one unit. There are today twenty-two sets of cards and ninety-five looms.

Barrett Ripley was superintendent from 1865 until 1887, F. Ripley, Sr., from 1887 until 1918, and F. Ripley, Jr., from 1918 until the present time. Mr. J. H. Elliott was president of the corporation from 1865 until about 1887. W. H. Elliott was president from 1887 until 1918. F. Ripley, Sr., was president from 1918 until the present time. The original treasurer was R. H. Porter. He was succeeded by W. R. Porter who holds that office at the present time.

The Troy Blanket Mills are today the leading manufacturers in this country of horse blankets and other horse clothing. L. C. Chase & Company, of Boston, New York, Chicago, Detroit, and San Francisco, have always sold the product of these mills.

HUNTER MANUFACTURING AND COMMISSION CO.

INTERNATIONAL DISTRIBUTORS OF COTTON FABRICS. THEIR FIFTY MILLS

The title, "International Distributors," is literally descriptive of the function of this organization which is the outlet for the products of fifty mills known for the uniformly high quality of their products. These products consist entirely of cotton fabrics and are controlled exclusively by the Hunter Manufacturing & Commission Company. Their market is the world; their business has been ambitiously developed over a period of twenty years on the basis of honest business methods and genuine service.

The origin of the firm was in Greensboro, North Carolina. J. Speight Hunter, a successful merchant of that city, in February, 1897, founded the organization which has since borne his name and remained an enduring monument to his wisdom and foresight. His splendid ideals of merchandising followed a logical course of growth, and soon the business spread beyond its local confines. A sales office was opened in New York City in 1899, and in the following year, one in Baltimore, Md. Since the death of Mr. Hunter in 1905, expansion has continued with remarkable rapidity. By 1907 there was a Boston office and by 1909

a St. Louis office. The executive offices were removed from Greensboro, N. C., to New York City in 1912, at which time the Company controlled the products of fifteen mills. Chicago and Philadelphia were shortly added to the list of sales centers. Recently offices were opened in Cleveland and Kansas City. This is now further augmented by numerous foreign markets where the firm has become effectively represented. They have offices in Buenos Aires, Argentine; Curacao, D. W. I.; Barranquilla, Colombia, Caracas, Venezuela; Valparaiso, Chile; Mexico City, Mexico; Hayana, Cuba; and San Juan, Porto Rico; besides agents at strategic points at home and abroad. Their promotion of foreign trade in cotton goods is a development of noteworthy character, achieved on merit and reflecting the new movement of American manufacturers into the channels of international commerce.

The pride of the Hunter Company is their mills, over fifty in number, producing brown and colored cotton piece goods, cotton ducks, sheets, quilts, towels and similar fabrics. Readers who are statistically minded will be interested in the statement

that the combined investment of these mills is nearly \$40,000,000 and the combined production is over 250,000,000 yards per

An enumeration of the mills will indicate the representative plants whose products are sold by these "International Distrib-

utors":

Alice Mills, Easley, South Carolina; Anderson Mills, Lincolnton, No. Carolina; Avondale Mills, Birmingham, Ala. Cedartown, Ga.; Corsicana Cotton Mills, Corsicana, Texas; Deep River Mills, Randleman, N. C.; Echota Cotton Mills No. 1, Calhoun, Ga.; Echota Cotton Mills No. 2, Rome, Ga; Enoree Mills, Enoree, S. C.; Entwistle Mfg. Co., Rockingham, N. C.; Exposition Cotton Mills, Atlanta, Ga.; Fitzgerald Cotton Mills, Fitzgerald, Ga.; Globe Mfg. Co., Gaffney, S. C.; Grendel Mills, Greenwood, S. C.; Greenwood Cotton Mills, Greenwood, S. C.; Hannah Pickett Mills, Rockingham, N. C.; Henry Cotton Mills, Hawkinsville, Ga.; Jackson Mills, Iva, S. C.; Jefferson Mills, Jefferson, Ga.; Judson Mills, Greenville, S. C.; Lowe manufacturing Co., Huntsville, Ala.; Mary Leila Cotton Mills, Greensboro, Ga.; Mooresville Cotton Mills, Mocresville, N. C.; Mollohon Mfg. Co, Newberry, S. C.; Midway Mills, Rockingham, N. C.; Ninety Six Cotton Mills, Ninety Six, S. C.; Nokomis Cotton Mills, Lexington, N. C.; Oconee Mills Co., Westminister, S. C.; Pee Dee Mfg. Co., Rockingham, N. C.; Pell City Manufacturing Co., Pell City, Ala.; Pomona Mills, Greensboro, N. C.; Rabell Manufacturing Co., Selma, Ala.; Republic Cotton Mills, Great Falls, S. C.; Roberdel Mfg. Co., Rockingham, N. C.; Sanford Cotton Mills, Sanford, N. C.; South Texas Cotton Mills, Brenham, Texas; Steele's Mills, Rockingham, N. C.; Swift Mfg. Co., Columbus, Ga.; Sylvan Cotton Mills, Shelbvville, Tenn.; Texas Cotton Mill Co., McKinney, Texas; Tupelo Cotton Mills, Tupelo, Miss.; Victoria Cotton Mills, Rock Hill, S. C.; Victory Mfg. Co., Fayetteville, N. C.; Walton Cotton Mills Co., Monroe, Ga.

The Hunter Manufacturing & Commission Company is the main artery through which flows a steady stream of merchandise from these separate but united industries to the universal textile market. At the Company's headquarters, 60 Worth street, New York City, the animating spirit, as elsewhere, is one of service. The officers are where, is one of service. R. E. Reeves, president; George Walcott, vice-president and treasurer; G. O. Hunter, vice-president; Floyd W. Jefferson, vice-president; N. J. Causey, assistant treasurer; and J. C. Watkins, secretary.

NEILD MANUFACTURING CORP.

Since 1910, when it was established, the Neild Manufacturing Corporation has been one of the most prosperous cotton mills in New Bedford, Mass., and in fact, in New England. This mill was organized by John Neild, the president, agent and general manager, who has come to the front by sheer ability, and has proved his worth, not only as a manufacturer, but also as a merchant. Mr. Neild is well liked, of high standing, sound common sense and many years' experience in cotton manufacturing.

He started his textile work in England. Coming to this country, he took a position as a spinner in the Wamsutta Mills. While doing this work he was elected secretary of the New Bedford Mule Spinners' Union and he knows the standpoint of the operative as well as that of the employer. Later he became overseer of the mule-room. His ability was recognized and he was made superintendent of the Wamsutta Mills. In 1901 he was chosen agent of the Grinnell Manufacturing Corporation. He served in that capacity until 1909, and while there saw and many similar fabrics, with a long list the opportunity for a mill which would manufacture plain and fancy silk and mercerized specialties. Others who had confidence in him, knowing his work, quickly joined with him in the venture and so the concern was incorporated in 1910. Although he had been an able manufacturer, particularly of fine goods, he had never previously attempted merchandising. His success demonstrated his efficiency in that section of the textile industry and received recognition by another corporation, the Bristol Manufac-turing Company, of which he was made general manager.

During the depression of 1920-1921, the Neild Mill was operated with comparative steadiness and fairly near full capacity and was also one of the first to reach a full time basis when business showed signs of improvement. It had already established a widely recognized reputation on certain specialty lines, such as handkerchief goods,

of regular customers who insist upon having Neild-made fabrics. With the return of confidence in cotton goods values, these customers have been buying more and more freely and it is said that the Neild could have easily sold its product through the winter months of 1920-21 had the management been willing to do so at the present (August, 1921) basis of prices.

As mentioned above, the Neild Manufacturing Corporation is one of the most prosperous in New England, in the year 1920 cutting a melon of twenty-two per cent. In 1919, the corporation paid a dividend of twenty per cent. Dividends in other years are as follows: In 1913, four and a quarter per cent; 1914, five per cent; 1915, five and a half per cent; 1916, eight and a half per cent; 1917, eighteen per cent; 1918, nineteen per cent.

The corporation is capitalized for \$800,-000 and has \$150,000 worth of bonds outstanding, but its balance sheet at the close of business December 31, 1920, showed a net surplus of quick assets over liabilities amounting to no less than \$1,034,017. Outside of its bonded debt it showed bills payable of only \$21,890, while its inventory was evidently taken on the deflated basis, showing only \$357,559, and being among the smallest inventories of the entire New Bedford list. The shares of the Neild Manufacturing Corporation very seldom come on the market and are difficult to obtain in quantity. Current quotations for them are around 275 to 280 though it is doubtful if any considerable quantity could be bought at this level.

The equipment of the Neild includes 108 cards, 1420 broad looms, 28,160 ring spindles, 26,268 mule spindles and 1000 twister spindles. Five hundred hands are employed at the mill.

The officers of the mill are as follows: President, John Neild; treasurer, Joseph H. Allen. Directors—John Neild, Charles M. Cole, Frank Croacher, John W. Bannister, Frederick H. Taber, Frank !. Neild and Frank S. Wilcox.

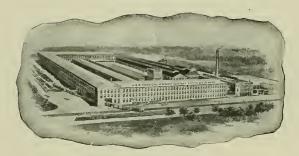
H & B AMERICAN MACHINE CO.

The H & B American Machine Company, of Pawtucket, R. I., was established in 1894, under the name of Howard & Bullough American Machine Company Limited. For many years the name of "Howard & Bullough" has been known throughout the textile manufacturing countries of the world, Messrs. Howard & Bullough, Ltd., of Accrington, England, being one of the pioneer builders of modern cotton spinning machinery.

The American plant was equipped to build a similar line of machinery to that produced in England. The output at first Martin; and purchasing agent, John W. Richardson. All of them have been associated with the business for many years.

The highest standard has always characterized the machinery produced by this firm, and they have introduced many patented devices for the treatment of cotton in its various processes of manufacture into yarn.

The shops are equipped with the latest and most improved tools, the majority of which have been specially designed for their particular work. About 1200 skilled operatives are employed, and a service de-



Plant of H & B American Machine Company

consisted of a limited line of picking machinery, revolving flat cards of an improved type and drawing frames fitted with electric stop motion. As these machines met with immediate success, additions were undertaken at once to increase the output and provide for the manufacture of slubbing, intermediate and roving frames. Later enlargements included floor space for building ring spinning frames and twisters of an improved design.

Continued growth of the Company led to its re-incorporation in 1912 under its present name. The officers are as follows: President, Charles E. Riley; treasurer, E. Russell Richardson; secretary, Edward L.

partment is maintained for registration and employment purposes. Beneficial and athletic associations, under the management of the employees, are maintained, and a monthly bulletin of various shop activities is published.

The present output of the works consists of hopper bale openers, conveying and distributing systems, automatic feeders, self feeding openers, vertical openers, breaker, intermediate and finisher lappers, roving waste openers, revolving flat cards, drawing frames with mechanical and electric stop motions, slubbing, intermediate and roving frames, spinning frames, twisters, and winders.

HOWARD BROS. MFG. CO.

Established in 1866, Howard Bros. Mfg. Co. have carried on a successful business for fift -five years. Their product, including card clothing, hand stripping cards, napper



HARRY C. COLEY

clothing, wire heddles, and hand strickles, all used in cotton, woolen, and worsted mills, by its quality has won a high place in the regard of its consumers. The above, as well as some other products they manufacture. consisting of special woven foundation for heavy wires, such as feed rolls and lickerins, and for heavy work, such as asbestos, have been so much wanted by the mills that the percentage of increase of business in recent years has been 200 per cent.

The business was founded by Albert H., Charles A, and John Howard in Worcester, Mass., where the establishment has continued, located at the present time at 44-46 Vine street. From a small beginning the demand grew, spreading all over the textile portions of the United States and Canada. An export trade has also been built up. The plant requires the services of 160 cmployees.

The concern enjoys the advantage of being close to all the raw materials needed in the manufacture of their product and also the benefit of excellent railroad facilities, making quick express and freight connections.

In addition to quality, service is another cardinal virtue of the Company, and they leave no stone unturned in their endeavor to improve both. The policy of the Company is to keep constantly in mind that a business cannot stand still and be successful, but must progress. It has been, still is, and always will be their purpose to have their customers absolutely satisfied and everything within the power of the management is done to keep their confidence. Howard Bros. Mfg. Coppreciate the value of advertising in furthering the interests of their business and use textile trade papers and souvenirs at textile conventions. The present officers of the com-



PHILLIPS B. MARSDEN

pany are: Herbert Midgley, president and general manager; Harry C. Coley, secretary and treasurer; and Phillips B. Marsden, superintendent.



Herbert hudgleg

W. H. LANGLEY & CO.

The firm of W. H. Langley & Company, which has a reputation of about ninety years of successful cotton goods selling, was founded by W. C. Langley, at 25 Broad street, New York. It is now a corporation, chartered in 1913, and deals wholly in southern cottons for the converting, manufacturing, jobbing, and export trades.

ings, and novelty skirt cords; and The Seminole Mills run on fine twills and repps. A recent acquisition is the Anderson Cotton Mills, of Anderson, S. C., in which W. H. Langley & Company now have a controlling interest.

W. C. Langley, esteemed as he was by textile men at large, is nowhere more affec-



Langley Mills, Langley, S. C.

In South Carolina are three mills with which the Langleys have had much to do. They are The Aiken Mills, of Bath, The Seminole Mills, of Clearwater, and The Langley Mills, of Langley. The last named was started in 1872 by W. C. Langley; The Aiken Mills were built in 1895, and The Seminole opened under the title of the Clearwater Bleachery in 1908. Within the last few years these mills have had a renaissance of their entire physical system.

tionately remembered than in Langley, S. C. The school founded by Mr. Langley is a memorial to his father, W. C. Langley, who died in 1891, and is probably one of the best of its kind either in the North or South. Seven school rooms, an assembly room, auditorium, library, and gymnasium, are the educational and recreational centers of the community.

The sales headquarters of W. H. Langley & Co. are at 77 Worth street, New



Aiken Mills, Bath, S. C.

The three units have been re-equipped with 2382 new looms, additions to the buildings constructed, the machinery brought up to modern standards throughout, and the various departments consolidated.

The Langley Mills manufacture twills, sheetings and drills; The Aiken Mills manufacture fine twills, print cloths, dobby shirtYork. The officers directing production of the mills are: William C. Langley, president; George E. Spofford, vice president; and George E. Leonard, secretary and treasurer. William McKinley, Jr., is vice-president and general manager of the sales organization, William H. Book is secretary, and George F. Benedict, treasurer.



THE LATE J. HARPER POOR

J. Harper Poor, who died in 1919, was one of the outstanding figures of the generation in the dry goods commission field. He represented the house of Amory, Browne & Co. in New York for years. From the beginning of his business career he was associated with the trade. He was born in Boston, December 17, 1862, the son of Edward Erie and Mary (Lane) Poor, and took his first position when a boy

with the commission house of Jacob Wendell & Co. In 1883 he became connected with his father's firm and a partner in 1892. With his brother, Edward E. Poor, he organized the firm of Poor Brothers in 1898, but in 1901 he severed this connection to form the firm of J. Harper Poor & Co. In 1906 this company consolidated with the dry goods commission house of Amory, Browne & Co., which was established in 1896.

H. A. METZ & CO., INC.

Colonel Herman A. Metz, president of H. A. Metz & Company, Inc., rose to his prominent position in the dyestuff industry from an office boy. Colonel Metz began work in 1881 with P. Schulze-Berge, New York City, the original founder of H. A. Metz & Company, Inc. Besides being at the head of the company mentioned above, he is also president of the Consolidated Color & Chemical Company, manufacturers of dyes in Newark, N. J. and the H. A. Metz Laboratories, Inc., manufacturers of medicinal products. The Laboratories were established in 1916 when the receipt of Salvarsan and Novocain from abroad ceased. He took up the manufacture of these very necessary products and supplied the U. S. Covernment for Army and Navy purposes during 1917 and 1918 with practically the entire output. He is also president of the Textileather Company, manufacturers of artificial leathers in Newark, N. J. and Worcester. Mass.; and vice-president and treasurer of the Central Dyestuff & Chemical Co., manufacturers of dyes and intermediates at Newark, N. J., and is an officer and director in various other manufacturing concerns. He is also a trustee of the First National Bank and the Fulton Savings Bank of Brooklyn. Mr. Metz' most active interests, however, are with H. A. Metz & Company, Inc. The other officers of his company are C. L. Gagnebin, Boston, vice-president; Charles Fuehrlein, treasurer; and A. H. Hein, sec-

In 1880 the company was founded and in 1883 the firm name became Schulze-Berge and Koechl. The following year the company combined with J. Movius & Sons (founded in 1860 as Rumpf & Lutz, then Lutz & Movius) and became Schulze-Berge, Koechl & Movius. It was incorporated as Victor Koechl & Company (H. A. Metz,

vice-president and treasurer), then as H. A. Metz & Company with Mr. Metz as president, in 1912 changing the name to Farbwerke-Hoechst Company to more closely identify it with the German plant whose goods they were importing. In 1917 he incorporated H. A. Metz & Company, Inc. In addition to the office in New York, located at 122 Hudson street, it has other offices in Boston, Philadelphia, Providence, Chicago, Charlotte and San Francisco.

Colonel Metz is a thirty-second degree Mason, Knight Templar, a member of the Royal Arcanum, the Benevolent & Protective Order of Elks and the Loyal Order of Moose, a trustee of the Masonic Home and Asylum, and is affiliated with various social and athletic clubs. He is a member of the Manhattan Club, the National Democratic Club, Chemists', Army and Navy, New York Athletic, Crescent Athletic and a number of other clubs, and the Democratic County General Committee of New York.

Colonel Metz has in recent years occupied a high place in politics, both in the nation and locally. He served as a member of Congress from 1913 to 1915 and as comptroller of the City of New York from 1906 to 1910. He was twice a member of the New York Board of Education, and of the State Board of Charities. When the United States entered the World War, he was a captain in the National Guard Reserve. He immediately enlisted and was appointed Lieutenant-Colonel of the Fourteenth Infantry, N.Y.G. which furnished several companies for service in the state in guarding the Aqueduct and in drilling recruits and furnishing non-commissioned officers for service abroad. In December, 1921, he was appointed colonel on the Headquarters Staff, a rank he still holds. His father was born in Germany and came to the United States in 1848.



COL. HERMAN A. METZ

AMERICAN BLEACHED GOODS CO.

Relatively few facts need be told to delineate the unique position assumed by the American Bleached Goods Company. In brief, they are a corporation with a capital and surplus of about \$4,000,000 which is continuing the piece goods business formerly

Such brands as soisette, flaxon, permalawn and alpha cloth have a fixed rank among the most select fabrics of their kind on the market.

The American Bleached Goods Company are the sole selling agents for the



Ponemah Mills

controlled by Clarence Whitman & Company. Consequently, they are now the largest distributors in America of bleached, printed, and dyed fine cotton goods, and they have the organization and resources to maintain or further enlarge the already comprehensive scope of their activities.

Ponemah Mills and Patterson Mills Company. They also handle the confined product from many other mills. Some of these mills have been factors of importance in the evolution of American cotton goods production; each has had its separate history replete with events that in

their time marked significant changes; and they have survived as larger and more complete manufacturing units than were ever dreamed of by the early founders.

The Ponemah Mills, to notice first a famous precursor in several introductory movements, was founded at Taftville, Connecticut, in 1867. John Fox Slater, one of the noted New England family of textile manufacturers, put \$100,000 into the property as one of its promoters and had the plant brought to completion by 1871. He served as president throughout the remainder of his life, being succeeded in the position by his son, William Albert Slater, who retired in 1894. Then the property passed successively through the hands of the Lockwoods and Danielsons and later a group composed of Frank A. Sayles, J. A. Atwood and associates. Of these last, Charles O. Read is today the president, and J. A. Atwood, the treasurer.

Four inaugural dates in domestic textile production distinguish the record of the Ponemah Mill. Probably its greatest honor was in having been the first American mill to confirm on a large scale the manufacture of fine fabrics, or white goods. It was like-

wise the earliest user in this country of Egyptian cotton for fine yarns, and was also the first weaving mill in America to use combers. A crowning and novel distinction lay in its having made the world's initial production of balloon and airplane cotton cloths. Assertion of superior quality in Ponemah Mill products is but to reiterate the universal favor in which they are held. The present plant has 161,440 spindles and 3919 looms and engages 1400 workers.

The Patterson Mills Company, of Roanoke Rapids, North Carolina, J. A. Moore, president, makes a popular grade of ginghams on its 20,000 spindles and 625 looms. It was incorporated in 1909 with a capital of \$650,500.

The American Bleached Goods Company has large selling quarters in three cities—in New York, at 39 Leonard street; in Chicago, at 160 West Jackson boulevard; and in St. Louis, in the Syndicate Trust Building. The principal executives of the Company are: E. S. Twining, chairman of the board; W. F. Adam, president; Sinclair Richardson, vice-president; B. H. Smith, treasurer; and Charles Twining, secretary.

NORTH ADAMS MANUFACTURING CO.

The beginning of the North Adams Manufacturing Company dates back to a period of more than seventy years ago when Dr. Thomas C. Brayton, a public-spirited citizen and one of the pioneer mill men of Western Massachusetts erected a stone mill and began the manufacture of textile goods on the site of the hamlet now known as Braytonville, a suburb of North Adams, adjacent to a branch of the Hoosac river and conveniently near to the Boston & Albany railroad. The Fitchburg division of the Boston & Maine railroad connects with the suburb so that transportation facilities are provided for passengers and freight. The product of the mill when run by Dr Brayton included woolen hosiery yarn, all wool cloth, and cloth made with cotton warp and wool filling. Dr. Brayton was succeeded in the mill business by a corporation known as the North Adams Woolen Company which was founded in the year 1864. This company was composed chiefly of local men of whom one at least was already engaged in the manufacture of woolen goods. At that time there was a brisk demand for woolen cloth and for a while the new company prospered. With the end of the Civil War, however, there came a depression in business and like many other manufacturing concerns the one in question had a hard road to travel.

In the year 1874 the company was reorganized under the title of the North Adams Manufacturing Company, with a Mr. Blackinton, connected with the neighboring

Blackinton Woolen Company as president; E. B. Penniman, treasurer and buyer, and Thomas Sykes, manager and superintendent. Later, H. G. B. Fisher, a retired naval captain, who had married Mr. Blackinton's daughter, became president of the company, and for over thirty years the mill was run very successfully under the same management. The product under this régime was almost entirely a high class of woolen fabrics from pure virgin wool, without the admixture of any sort of waste whatever; even the best legitimate waste from the mill's own manufacturing was excluded and sold to outside concerns. Mr. Penniman had the credit of being the largest buyer of fine picklock wool in the market, and sometimes his wants in that respect could not be fully supplied. Mr. Sykes was a very practical and careful manufacturer and won an enviable reputation as an efficient and upright business man, always popular with his help and those acquainted with him. He withdrew from the company. in which he had become a large shareholder, about nine years ago, and started woolen manufacturing on his own account, in a mill belonging to him at Rockville, Conn., where he originally came from, and where his brothers and their descendants have won high fame as manufacturers of fine wool and worsted cloth. Mr. Sykes died at his home in Rockville a few years ago.

Swift Laurie, a son of the late Samuel Laurie, for a long time at the head of the Auburn, N. Y., Woolen Company, suc-

ceeded Mr. Sykes as manager of the North Adams Manufacturing Company. He held the position acceptably for several years, then resigned to be agent for the Bound Brook Woolen Company, Bound Brook,

Captain Fisher died in 1910, and was succeeded in the presidency of the company by his nephew, James F. Fisher, a manufacturers' selling agent with headquarters in New York City, Mr. Fisher was formerly a principal in the selling agency of Fisher and Francis, New York City, and a popular salesman in the trade. He retired from business a few years later, and the controlling interest in the manufacturing concern came into possession of Edwin T. Holmes, head of the Holmes Burglar Detective Agency centered in New York City. About the same time, Mr. Holmes' son, Edwin T. Holmes, Jr., was appointed agent and treasurer of the company and holds those positions at the present time. On account of long service and advancing years Mr. Penniman resigned his offices, ceasing to take an active part in the management of the mill some five years ago. He is now enjoying a well earned rest near the place where he long labored. In the summer time he usually resides at "Cheshire," an historic village a few miles south of North Adams, where he is interested in the "Ormesby farms creamery." He has also a residence in North Adams.

The capacity of the plant when the present company was formed was on the basis of ten sets, forty-eight inch wide carding

machines and forty-eight broad looms, but additions have been made from time to time so that now the capacity is fourteen sets of carding machines and sixty looms, driven by steam and water power. The plant is complete for the producing of woolen cloth for men's and women's wear, from the original wool to the finished product, which includes plain and fancy cassimeres, cheviots, and cloakings. The goods are sold direct to the wholesale trade through a selling agency, financially interested in the mill.

The plant and premises have been always well maintained and equipped with well approved devices for the saving of labor and material, as well as the improving of product. A few years ago the premises were greatly improved by hard wood floors laid down throughout the manufacturing departments. According to the last public report made by the company the capital stock is \$150,000, and the annual output of the mill when running at full capacity is \$700,-000 per year. The number of workers engaged is 250, and the pay roll \$160,000 per year. The main mill building is 207 feet long and 56 feet wide. An annex to this building contains the picker room and the wool-sorting room. The property of the company includes a large tract of land upon a portion of which are located a large number of comfortable houses for the employees. The trolley cars of the line between North Adams and Bennington run past the mill, accommodating employees living in North Adams and other places adjacent to the line.

SCHNABEL BROTHERS

The firm of Schnabel Brothers has had a long and honorable career in the American textile market, beginning when the textile arts were in a formative stage and making material contributions to their development. This house was founded in 1854 by Richard A. Schnabel who can review a period of service rivalled for length and consequence by few of his fellow merchants. Inasmuch as Mr. Schnabel has spent sixty-five years in the business and has not yet retired, it is fair to credit him with extraordinary ability and endurance. How swift must seem the evolution of "textiling" to one with such a prospective!

The first function assumed by the firm was the representing in America of some of the leading European manufacturers whose products—fine qualities of overcoatings, worsteds, and ladies' cloths—were introduced here with much success. One of the most prominent Belgian mills had its goods popularized in America through this agency. With all the flourishing import trade so established, domestic competition gradually brought American made fabrics to the fore. Schnabel Brothers were not slow to recognize the improvement in the domestic article and added the finer lines of goods to their list, cultivating a demand for them as energetically as they had previously for the foreign importations.

The late convulsion in world politics and attendant disorganization of commerce affected the policies of this as almost every other international house. The principal change, of course, was in the enforced dropping of foreign brands. The firm have now turned their attention more than ever to commercial banking and to acting as mill agents. Their financial strength has been utilized for the upbuilding of commercial developments which have met the exacted high standard and they are receptive to all new proposals of merit.

The men directing the present organization of Schnabel Brothers are Richard A. Schnabel, the founder; Paul E. Schnabel, his nephew; and W. L. Detmold. Mr. Paul E. Schnabel is in charge of the foreign department of the firm and is well qualified for this position, having received an extensive training in some of the leading European woolen mills and banking institu-tions. He had added to the number of foreign accounts represented by the firm, so that, in spite of the increasing predomi-nance in the American market of domestic

goods over foreign makes, the import busi-

ness of Schnabel Brothers will, on account of the variety of fabrics handled, remain important, once normal conditions in Europe are restored. Mr. W. L. Detmold, since he joined the firm in 1898, has been very active in its affairs, watching over the progress of each separate department of the business. Of prior experience he had had sufficient to make him acknowledged as one of the best versed textile men in the country, and the truth of the judgment has been borne out by the prosperity he has brought to Schnabel Brothers.

Among Mr. Detmold's early associations were those with A. D. Juilliard & Company, and Converse, Stanton & Cullen. During the time he was connected with the former house severe competition developed be-tween American and English mills, with an unexplained advantage on the side of the Englishmen. Mr. Detmold sent an investi-gator abroad who was probably the first American to discover that the reason for the English prices being what they were was that their mills were running two looms to a weaver at 120 picks to a minute as against one loom to a weaver at about ninety picks in the American mills. The information was conveyed at once to Mr. Hutchins of the Knowles Loom Works. Thus was the incentive given for the building of the first quick running looms produced in this country. When put to work they guickly equalized the situation by providing an output which compared favorably with the English

One of the flourishing departments of Schnabel Brothers is otherwise known as Libby & Company, composed of W. G. Libby and Colin McKenzie, Jr. They were the successors of H. J. Libby & Company, an early and renowned textile commission house that went out of business twelve years ago. As a part of the Schnabel organization they handle the products of many leading mills, including most of those represented by the old house.

Schnabel Brothers' business home at-80 Fifth avenue, New York, is the headquarters for a trade that embraces the en-tire United States. Some of their clients are of over a half a century's standing. which is a clear indication of integrity and wise business method. To the prediction that the coming era in American textiles will be one in which domestic goods will generally displace those of foreign manufacture, Schnabel Brothers add another affirming

opinion.

JOSEPH BANCROFT & SONS CO.

Hereditary influences plus strength of character manifest themselves in certain families by a genius for some particular form of industry. The father leaves to the son a heritage and intangible substance upon which the son builds a structure of still greater design to be in turn handed down to the leader of the next generation. Were there a Pantheon for the creators of the textile industries the Bancrofts would have a place therein. They have been constructors and innovators in the industrial sense, contributors to the thought of their times, notable citizens of the land in which they lived; and in the four million dollar corporation, with whose standards and achievements the entire textile world is conversant, is seen the effect of causes rep-

Finally, the decision having been made, a new home was found in Wilmington and here the father began the manufacture of flannels. Joseph, reaching his majority upon completion of the contract with Jacob Bright, came also to America to apply his talents under parental direction. He assumed a heavier responsibility in 1826 when he became superintendent of the Rockland Cotton Mills, owned by Wm. Young & Sons, on the Brandywine, above Wilmington.

At the end of five years Joseph's ambition had crystallized into a project of his own for which he found a financial backer in Thomas Janvier. In a small remodeled factory was begun the manufacture of cotton goods in a small way. Misfortunes



Joseph Bancroft & Sons Company's Plant on the Banks of the Historic Brandywine, at Wilmington, Del.

resenting four generations of men and nearly a century of unabated effort.

Two of the family, Joseph Bancroft and Samuel Bancroft, Jr., have personal histories of striking interest. The first was born in Manchester, England, April 7th, 1803, the second son of the thirteen children of John and Elizabeth (Wood) Bancroft. All, as had been their ancestors, were adherents of the Society of Friends, so young Joseph shared that faith and was educated in an institution conducted by the Society, the Ackworth School. Jacob Bright, an uncle, and the father of John Bright, Member of Parliament, apprenticed the lad in his cotton mill at Rochdale—an apprenticeship that lasted seven years, or until 1824. The mother had, before her marriage, crossed the water to visit relatives in Pennsylvania.

beset the young manufacturer. In 1839 floods destroyed the water-power dam and submerged the property with dire results. Joseph, disheartened, offered to turn over the plant to Janvier in repayment of his indebtedness but the latter, his confidence unshaken, loaned more money for the continuance of operations. With this fresh start the business was developed successfully and became a firmly anchored industry.

became a firmly anchored industry.

The Mills of Joseph Bancroft were not only remarkable by the then accepted standards of textile manufacturing but set a pace in advance of prevailing practices. Old equipment and old methods were discarded when improvements were suggested and found advantageous. Policies of management which in those days must have appeared Utopian were introduced by the

far-seeing founder who, ever in search of fresh ideas, journeyed to England in 1854 to make a tour of investigation among the cotton mills and finishing works. That trip may well have pointed the way to the inception in 1860 of a bleachery and finishing works at Rockford, Del., now a suburb

of Wilmington.

Joseph Bancroft was married in 1829 to Sarah Poole, daughter of William and Sarah Poole of Wilmington. To them were born two sons, William Poole, July 12th, 1835, and Samuel, Jr., January 21st, 1840. After these boys had attained manhood, or in 1865, they were admitted to partnership in their father's business, which became Joseph Bancroft & Sons. The father died December 8th, 1874, having lived to witness the material fruition of worthy ambitions and to add to the sum of wealth and happiness of all those who came within the sphere of his beneficence.

The three small dwellings adjacent to the original mill were the nucleus of a village that became noted for the happy condition of its prosperous inhabitants. The workmen had good reason to look upon their employer as a benefactor. Hard times in the country had no effect upon their fortunes. Cash wages of substantial amount were always forthcoming on Friday nights whether business was good or bad—an assurance that other industries rarely gave under the existing order—and the saving habit was encouraged by the giving of interest on wages left in the employer's keeping.

A library for the employees was another instance characteristic of the measures taken to insure the welfare of the community.

Throughout his life Joseph Bancroft was a staunch member of the Society of Friends. When that body divided into Orthodox and Hicksite, he adhered to the latter but labored to bring peace between the dis-

cordant factions. Until the end his influence, exerted by written and spoken word, was felt in the counsels of the faith in which he had been reared.

Samuel Bancroft, Jr., inherited many of the rugged virtues of his parents, had an indomitable force of personality that was sometimes misunderstood but always worked at the dictate of a strong conscience, and wielded an authority made greater by the expension of the industry and the broadened range of national affairs. During his boyhood vacations from the school of Samuel Alsop and the Classical Academy of T. Clarkson Taylor, in Wilmington, he busied himself at odd tasks at the textile mill and was taught to weave. At sixteen years of age he began work in earnest at his father's mill, year by year mastering the technicalities of the various processes and, in 1860, assuming supervision of the newly added departments of bleaching finishing.

When the firm was incorporated in 1889 Samuel Bancroft, Jr., was elected president and remained at the head until his death in 1915. During the period of his control the manufactory grew to be one of the three largest in Delaware. He took a directing part in concerns other than those that made him a prominent figure among textile manufacturers. These connections included the presidency of the Huntington & Broad Top Mountain Railroad & Coal Company and directorships in the Wilmington Trust Company and the Baltimore, Chesapeake & Atlantic, Maryland, Delaware & Virginia, and Delaware Railroads, and other companies.

Business and finance represented to Samuel Bancroft, Jr., only one of several mediums of action and his tastes were of a catholic quality. He took a keen interest in the problems of the Government, was

quick to answer the calls of patriotism, and vigorously championed every reform that appealed to his sense of right. Starting in political life as a Republican, and elected on that party's ticket to the House of Representatives of the General Assembly of Delaware in which he served for New Castle County throughout the session of 1867, he later found himself at odds with the Republicans on questions of tariff, state rights, and other matters, and eventually joined the rival party. Mr. Bancroft's advocacy of Democratic doctrines was embodied in militant form in the columns of "Every Evening," published by the Every Evening Printing Company in which he had acquired an interest in 1872. Ever earnest in his efforts for good government in city and state, from 1895 until the close of his life he served on the board of park commissioners and was deeply interested in civic institutions. He and his brother, William P., president of the board of park commissioners, were the donors of valuable lands to the city of Wilmington. For twenty years he was a trustee of the Homeopathic Hospital, besides extending his aid to many philanthropies.

June 8th, 1865 was the date of Mr. Bancroft's marriage to Miss Mary Askew Richardson, daughter of Samuel Richardson and Susanna Robinson of Wilmington. Their two children, Elizabeth R., born May 7th, 1871, and Joseph, born May 18th, 1875, are both living. The former married John Blymer Bird of Wilmington, and the latter is now one of the executives of the

Bancroft textile enterprises.

Samuel Bancroft, Jr., died April 22nd, 1915. Like his forebears, he was a loyal supporter of the Society of Friends. By nature unpretending, forcefully direct and occasionally blunt in speech, he had profound sympathies and possessed a breadth

of culture exceeding what would befit a man of wealth of his generation. Art, of which he was a generous patron, and literature vied for place among his personal pursuits. He possessed a famous collection of the English Pre-Raphaelite school of paintings and a choice library. He was one of the original members of the Wilmington Society of Fine Arts.

Joseph Bancroft & Sons Company, as at present constituted, dating from 1917, upholds the traditions upon which it was founded and is ably managed by members

of the Bancroft family.

John Bancroft, a grand-nephew of the founder, is president; Joseph Bancroft, vice-president; John Macadam, vice-president; Robert O. Cooke, treasurer; and John B. Bird, secretary. The board of directors further includes William P. Bancroft, son of the founder, John Bancroft, Jr., Earl S. Jenckes, and William C. Biddle.

The parent organization at Wilmington, controlling a cotton factory and other property, bleaches, dyes and finishes cotton goods, processing, roundly, 320 tons each

week.

A second corporation was formed May 26th, 1911,—Joseph Bancroft & Sons Company of Pennsylvania—capital \$600,-000.00. Its officers are, John Bancroft, president; Earl S. Jenckes, vice-president; Robert O. Cooke, treasurer, and John B. Bird, secretary. The mills of this Company are at Reading, Pennsylvania, have 630 looms and 24,832 spindles; make the gray goods which are the basis for the well-known book cloths and window hollands, and are dyed and finished at Wilmington by the parent Company. The production of the Bancroft Mills, so favorably is it known, cannot suffer from omission of a detailed description. It is a standard reliance of the American textile market.

SUSSEX PRINT WORKS

The Sussex Print Works, Sussex County, Newton, N. J., are printers, dyers, and finishers of textiles, composed for the most part of silk; but they include all textiles of the higher class of silk mixtures in the piece. This company was formerly a department of the Valentine & Bentley Silk Company, but was incorporated as the Sussex Print Works in October, 1911, having outgrown itself as a department, under the very capable advice of Mr. Thomas W. Bentley, and management of his son, Mr. Herbert Bentley. Since its incorporation, it has endeavored to deliver only high grade work for the trade, and has always considered that quality and not quantity, was the desired goal.

In 1913, Mr. Harry T. Rounds became president, with Mr. Herbert Bentley as treasurer and general mill manager. Since that time, the quality has, if possible, improved and the quantity of work handled very greatly increased. Today, they rank second to none in their class of work. The New York office is at 404 Fourth avenue, and in direct charge of Mr. Rounds, with Mr. Valois Varick as general representative.

The Company is also fortunate in having added to its directorate, Mr. Walter C. Lee, who came with the Company early in 1921, as its vice-president, bringing an experience gained from service with some of the largest companies, both in this country and in England, and is thoroughly familiar with the dyeing and finishing of all textiles. This places the Sussex Print Works in the front ranks, in the piece dyeing, as well as in the

printing of textiles.

It is a fair statement to make that the factor which has been the strongest in bringing success to this business was the liberal and timely advice of its founder, Mr. Thomas W. Bentley, who, though now not actively engaged in the company, still remains as Other factors which play a a director. strong part in the growth of the company are that the officers are very active, each at his respective end of the business, and though young men, have had wide experience in their particular and especial lines. A condition which should also not be forgotten, is that this company has been content with a comparatively slow but steady growth, with a policy of protecting their accounts from the piracy of patterns, as well as cloths which is such an apparent evil in the converting business of today.

A maxim which the Sussex Print Works have used to themselves is: "Our customers are our friends," against a policy which seems to exist in some lines that they are not, but to be used only for exploitation. The management looks forward to continuous growth on the same substantial basis and will follow out the same plans and policies which have brought them their merited

success.

WOODWARD, BALDWIN & CO.

A firm that has been in business nearly one hundred years needs little introduction to its professional confrères, but a review of the cotton goods commission houses would be far from complete without a description of Woodward, Baldwin & Company, who are on the final stretch of a century of service.

Their earliest predecessor was the firm of Jones & Woodward, established at Baltimore, Md., in 1828. The title was changed in 1844 to William Woodward & Company. When, in 1856, Christopher Columbus Baldwin was admitted to partnership, the title assumed the final form of Woodward, Baldwin & Company. Four years later Mr. Baldwin, with Elijah P. Smith and Rignal T. Woodward, went to New York City and there founded a firm under the name of Woodward, Baldwin & Company, which has since continued in business uninterruptedly.

The name is one of the most familiar in the down-town textile district of the metropolis. It has been affixed to the building at 43-45 Worth street for the past fortyseven years, where it invites entrance to the large ground floor salesrooms and offices.

In comparison to the age of the house, the personnel has undergone few changes in recent years except in one way of addition. William H. Baldwin, whom the population of New York's textile mart know by his first name, is the head of the business, and associated with him are Summerfield Baldwin, Jr., J. Worthington Dorsey, Willard A. Baldwin, C. Columbus Baldwin, Frank Duane DuBarry, and Thomas F. Walsh.

The secret of the firm's success, as they have given out, is simple: "Attending strictly to our commission business-never buying any goods or converting any cloth.' More concretely stated, they are the selling agents for some forty cotton mills among the prominent producing units of the South. A partial list includes the Piedmont Manufacturing Company, F. W. Poe Manufacturing Company, Lydia Cotton Mills, Woodside Cotton Mills, Pickens Mills, Poinsett Mills, Orr Cotton Mills, Easley Cotton Mills, Woodruff Cotton Mills, Franklin Mill, Glenwood Cotton Mills, Brogon Mills, Williamston Mills, Chiquola Manufacturing Company, Toxaway Mills, Brandon Cotton Mills, Lois Cotton Mills, Eureka Cotton Mills, Hartwell Mills, Pelzer Mfg. Co., Belton Mills, Cowpens Mfg. Co., Georgia Cotton Mills, Inverness Mills Co., Laurel Mills, and the Roswell Mfg. Co.

All weights and constructions of print cloths in plain and fancy weaves, brown sheetings, shirtings, drills, colored yarn woven goods, fancy woven grey cloths, ducks, and outing flannels, are the principal products of these mills. Woodward, Baldwin & Company are their exclusive distributors. The sales territory knows no boundaries, as the Company have extended their trade throughout the world, becoming one of the foremost of cotton goods export houses. The Company's branch offices in this country are located at Baltimore, St. Louis, St. Joseph, Philadelphia, San Francisco, Boston, and Chicago. Their branch at Shanghai, China, serves a growing commerce in the

Far East.

THE ROESSLER & HASSLACHER CHEMICAL CO.

The "oaks from acorns" principle is very frequently illustrated in the growth of American commercial institutions, so often as to make it the foregone conclusion preceding the reading of most business histories. Franz Roessler, in 1882, began the manufacture of a preparation for gilding china, porcelain and glass. He called it "Liquid Bright Gold." The Roessler & Hasslacher Chemical Company of 1922 produce and act as agents for an array of chemicals catalogued from A to Z with names mysterious and formidable sounding to the layman. Upon some of these fruits of the mine and chemical laboratory depend essential industries. One of those is the textile industry.

"Liquid Bright Gold," made first in Brooklyn, N. Y., filled a need theretofore covered by importation. Its success was sufficient to attract the interest of Jacob Hasslacher who in 1884 joined with Mr. Roessler in forming the partnership of Roessler & Hasslacher. One of their early moves was the transfer of the plant from Brooklyn to Perth Amboy, N. J., where their policies took definite shape. Continuing the manufacture of "Liquid Bright Gold," they added acetone, from acetate of lime, and chloroform, derived from acetone. The partnership became a corporation in 1889 under the title of The Roessler & Hasslacher Chemical Company. About two years after the incorporation a fresh

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Plant of Niagara Electro Chemical Company, Niagara Falls, N. Y.

If bricks cannot be made without straw, neither can woolens, cottons or silks be put on the market without dyes and numerous accessory chemicals. The Roessler & Hasslacher Company, which are classified with the handful of America's best recognized chemical manufacturers, are dealers in chemicals of widely varied application. By the nature of their business they are feeders of many industries, but their products for the textile mill entitle them to special notice in conjunction with other co-operative forces in the making of textiles. The history of Roessler & Hasslacher is expansion, step-like progression, multiplication of products, new processes, new plants, new achieve-The Company acquired an ever increasing number of resources, best shown in chronological sequence.

impetus was given the business by the introduction of several new products. Ceramic colors, used for the decoration of china, porcelain, and glass, appeared. Then oxide of tin was produced on a large scale to satisfy the needs of the newly established enameling industry from which came wrought iron kitchenware and cast iron goods for bath tubs and sanitary ware. Cyanide of potassium was manufactured from imported and domestic prussiate of potash, in the beginning without sodium, but later with its addition, according to Castner's process.

Before 1896 sodium was imported. Its domestic production began in that year stimulated by increased consumption of cyanide on the part of the gold mining companies (extraction of gold by weak cyanide solution). The Roessler & Hass-

lacher Company participated with foreign interests in founding the Niagara Electro Cheviical Company with electrolytic works in Niagara Falls, N. Y., to manufacture metallic sodium and peroxide of sodium under the patented processes of Hamilton Y. Castner. The synthetic manufacture of cyanide of sodium was begun in the Perth Amboy plant of the Niagara Electro Chemical Company in 1902. Shortly after, the Company formed the Perth Amboy Chemical Works for the production of formaldehyde. In 1906 the Company installed platinum smelting works for refining platinum and producing platinum sheet, wire,

they rendered valuable service to textile manufacturers by introducing the benefits of oxygen bleach also made available for households and laundries. Oxone (patent of Drs. Foersterling and Philipp) is a fused peroxide of sodium which delivers in convenient form pure oxygen for use by physicians, for laboratories, for calcium light apparatus and other devices.

A notable product brought out by Roessler & Hasslacher during 1911 was a series of triple salts known by the trade-marked name, "Trisalyt," compositions of copper, zinc, gold, and silver, with cyanide, used for electro-plating. Its employment both



Perth Amboy Chemical Works

etc., and in 1910 created the Enamel Company of America, succeeded lately by the Stibium Products Company, which manufactures leukonin (an antimoniate of soda), used by enamelers, and other antimony products. Since 1910 the large interests of Roessler & Hasslacher in Mexico have been represented by the Mexican Roessler & Hasslacher Chemical Company. Additional developments of the year of 1910 included an association with Dr. L. H. Baekeland, and others, in the formation of the General Bakelite Company, having a factory at Perth Amboy, N. J.

Of especial significance has been Roessler & Hasslacher's production of peroxides. They supplemented their peroxide of sodium with the peroxides and perborates of other metals, hydrogen peroxide etc. Thus simplified and improved the manipulation of the plating bath. Throughout most of these years the Company carried on an extensive trade in the alkaloids manufactured by Dr. Louis Schaefer of Maywood, N. J., and lately by the Maywood Chemical Works.

They represent numerous other important domestic and foreign manufacturers and are therefore first hands in the most important chemicals handled by them. Anhydrous ammonia, arsenic, sal ammonia, antimony oxide, antimony salts, chloroform, chlorine derivatives, glauber salts, bleach, oxalic acid, carbonate potash, caustic potash, permanganate of potash, prussiate of potash and soda, phosphate of soda, sulphide of soda, zinc chloride and formaldehyde are among these in wide demand.

VICTORIA MILLS

The Victoria Mills enjoys the distinction of being one of the first mills built in this country solely for the producing of tops. This pioneer Mill was established in Thornton, Rhode Island, in 1898, several years before various other mills now in the business were erected. The peculiar softmess of the water obtained from the stream

mand that in recent years the mill has been enlarged almost 100 per cent.

The equipment of this plant includes three sets of scouring machines, thirty-two worsted combs, and twenty-seven Noble combs. Its sorting rooms are extremely light and there is accommodation for over one hundred sorters.



Victoria Mills, Thornton, R. I.

on which this mill is located enables them to scour wool leaving it in a very soft condition, and with an extremely good color.

This mill for the las' seven years has operated strictly as a commission wool combing and wool scouring plant and does not comb or scour any wools for itself. Its products have been in such great de-

It has been very successful in producing tops which will dye absolutely uniform color and at the same time absorb a minimum amount of dye. This mill is also a producer of Degras, commonly known as wool grease, in fact it is the second largest producer of acid wool grease in the United States. Under normal conditions they employ about five hundred.

TERMINAL WHARF AND WAREHOUSE CO.

With 10,000,000 cubic feet of modern fire-proof buildings, the establishment of the Terminal Wharf and Railroad Warehouse Company in the Charlestown District of Boston stands as a monument to the enterprise and industry of Harry H. Wiggin, as well as those associated with him during its development. About fifteen years ago Mr. Wiggin was operating a lumber yard in Charlestown. The yard carried with it rights to flats extending out in the Mystic River to the harbor commissioner line. Mr. Wiggin, with keen foresight saw the possibilities of the harbor frontage. He had no difficulty in securing capital in addition to his own, so that a dock 800 feet long and a pier of the same length, and 150 feet wide, were constructed. After railroad sidings were built, the warehouses were erected.

West. They handle the custom house details, transfer the merchandise to the warehouse, insure, weigh it, and have the warehouse receipts delivered to the western merchant's bank.

Another most interesting service rendered by the Company is the fumigation of all foreign cotton, cotton waste and other imported goods as required by the Federal Horticultural Board. The above services, as well as deliveries, are performed without requiring the customer to come to Boston at all.

The Company not only handles merchandise for its customers but it also rents space to manufacturers or merchants who take as much as they need in units of 5,000 or 6,000 feet and also the necessary rail-



Terminal Wharf and Railroad Warehouse Company, 50 Terminal Street, Eoston (29), Mass.

These warehouses, with facilities for handling the vast amounts of goods which are ever coming and going, constitute one of the advantages which Boston offers to the merchant and the shipper, not only local, but in the Far West. The equipment, which is of the most modern and efficient kind, includes electric portable cranes, electric tiering machines, besides whips for rapid hoisting on the exterior of the warehouses nine stories high. The fireproof construction and sprinkler system are such that lowest rates of insurance are allowed. Electric trucks, designed for conveying heavy merchandise, are available if needed.

As noted above, goods are shipped to and forwarded from the West. The Terminal Wharf and Railroad Warehouse Company take care of imports of goods for the road sidings, power and light. It is probable that there will be a further development of twenty-six acres of property, which the Company leases and controls, adjoining the present plant. The construction will be similar to that of the present buildings and dock.

It is a notable fact that this establishment is an immense enterprise which has been established by a Boston man with Boston money, in and for the port of Boston. Merchandise from all parts of the world, for use in the manufacture of various finished products, is constantly flowing through the dock and warehouses. Whether this merchandise is forwarded immediately to its ultimate destination or retained in the warehouses, it is under charge of experienced men in the employment of a concern of absolute integrity.

WORUMBO MANUFACTURING CO.

The Worumbo Manufacturing Company, located at Lisbon Falls, Maine, on the Androscoggin River, was incorporated in 1864 under the laws of the State of Maine as the Little River Manufacturing Company. In the following year the name of the corporation was changed to the Worumbo Manufacturing Company, which soon established such a reputation for its product that the name has been well known as a symbol for quality for more than half a century.

The dam and first mill at Lisbon Falls were erected under the personal supervision of Oliver Moses of Bath, grandfather of the present treasurer, and Edward Plummer of this position because of his long connections with the Company. He had been assistant treasurer for twenty years and previous to that time had eight years of practical mill work.

Frank Gutmann was made agent in 1865 at the age of thirty-three. His thorough knowledge of woolen manufacturing had been acquired in Saxony, and had been supplemented by valuable experience in this country. He was a man of the strictest integrity and the highest ideals, of remarkable constructive and executive ability, energetic, zealous, and untiring in his devotion to the interests of the Company. Under his management the reputation of the Worumbo



Plant of Worumbo Manufacturing Company

Lisbon Falls, who with John G. Tebbets of Lisbon and Galen C. Moses of Bath, constituted the first board of directors. The thoroughness and attention to detail which has always been a characteristic of the Worumbo is attested by the condition of these early structures today.

Oliver Moses was the first president of the Company, and the largest shareholder. He continued the financial and official head of the corporation until his death in 1882. The success of the company was in no small measure due to the sagacity, soundness of judgment, and upright character of its first president. Galen C. Moses, the first treasurer, held his office for over fifty years, until his death in 1915. He was succeeded by his nephew, the present treasurer, Oliver Moses, who was well qualified for

products for excellence in quality was firmly established. He was at the same time a builder and developer and increased the size and capacity of the mill over 150 per cent. Mr. Gutmann was educated in advance of most manufacturers of his day. He had access to woolen mills in England, Germany, and Scotland, and by his frequent visits to these countries kept in touch with the best that was being done. The standard which he established for the product of the Worumbo Manufacturing Company has been well known for many years both in this country and abroad. The Worumbo Manufacturing Company was awarded the gold medal at the Centennial Exposition in Philadelphia in 1876, and at the Columbian Exposition of 1893 in Chicago.

Mr. Gutmann's connection with the mill continued, with the exception of his absence from 1891 to 1895, for a period of over fifty years until his death in 1918. He was succeeded by his son, Walter U. Gutmann, who had studied manufacturing in Europe and was trained under his father, having the advantage of close association with him in the work for twenty-five years.

A large concrete mill was erected in 1920. With this addition, the modern dye house, and a new boiler house, the Com-

pany has a complete equipment for production on a large scale. The Worumbo manufacturers chinchillas, beavers, kerseys, meltons, montagnacs, fancy overcoating, covert cloths, broadcloths, bolivias, cloakings, fancy dressgoods, uniform cloths, and limousine linings, all of the highest grade. The officers of the Company are as follows: President, Walter U. Gutmann; vice-president, William H. Newell; treasurer, Oliver Moses, and clerk, Walter E. Plummer.

SO. COTTON MILLS AND COMMISSION CO., INC.

At 72 Leonard street, New York, are the main sales offices of the Southern Cotton Mills and Commission Company, Inc. This corporation, created September 30th, 1916, succeeded an older company of the same general title originating in Savannah, Ga., in 1900, whose officers were: M. B. Lane, president; H. D. Stevens, vice-president; and Irvin B. Tiedeman, manager of the New York office at 69 Worth street, who had charge of the selling arrangements.

When the original company liquidated in September, 1916, the present corporation, chartered under the laws of Delaware, assumed control. In the comparatively short period of its existence the new Company has proven its value as an agency for meritorious products of the particular type in which it specializes. It is now led by officers who are bringing to its management the keen impulse of new development in harmony with the forces animating the whole textile world. They are: Irvin B. Tiedeman, president; J. E. Martin, vice-president; Irvin Bruce Tiedeman, treasurer; Thomas F. Boyher, secretary.

The corporation is sole selling agent for five Southern mills: The Strickland Cotton Mills, Valdosta, Ga.; Moultrie Cotton Mills, Moultrie, Ga.; Poulan Cotton Mills, Poulan, Ga.; Eastman Cotton Mills, Eastman, Ga.; and Royal Cotton Mills, Wake Forest, N. C. The output has been marketed through the Southern Cotton Mills and Commission Company and its predecessors from the time the mills were built at different dates between 1900 and 1905. A large bulk of the product is consumed by the bag trade and the converters, while one mill manufactures almost totally for export to South and Central America where a lively demand has arisen for their goods.

Irvin B. Tiedeman, president, and the moving spirit of the corporation, was formerly prominent in the mercantile and banking circles of Savannah, Georgia. His association with the early commission house of that city resulted in his moving to New York, January, 1900, to open their first office there. J. E. Martin, present vice-president, joined Mr. Tiedeman at the start of the business in New York. Mr. Martin has spent his entire life selling cotton goods and is vell-known to the New York market.

NATIONAL SILK DYEING CO.

The strength of the National Silk Dyeing Company is in the amalgamation of several of the most important skein silk dyeing concerns whose coalescence in 1908 created the largest industrial unit in the world devoted exclusively to the dyeing of silk. Any review of the silk production of the country, coupled with statistics showing the division of effort along the route travelled by the lustrous fibre from cocoon to colored fabric, will demonstrate the degree of dependence placed upon the silk dyers. Silk dyeing is a more concentrated industry than that of the construction of the cloth itself, but the former has many representatives. With but one exception, none of the silk manufacturers of America carries the raw product through to the finished article. Most of them delegated the dyeing to the superior skill and facilities of the firms specializing in the science.

A capital of \$20,000,000 is invested in the National Silk Dyeing Company, which operates eight plants at Paterson and Dundee Lake, N. J., and Allentown and Williamsport, Pa. Every process related to the coloring of silks is practised within their walls. These processes, roughly classified, fall into three divisions. Silks are either dyed in the yarn, before weaving, or afterward in the piece, and then may come the printing, if a colored design is to be im-

pressed upon the fabric.

Skein silk dyeing, or dyeing in the yarn, is done in styles of many descriptions for several classes of textile manufacture. In this department as in all others the effects of modern mechanical ingenuity and scientific precision of every detail are observable; in truth, such an establishment as the National Silk Dyeing Company exhibits developments of method on a par with the advanced position now held by the American textile industry as a whole. No longer is the yarn hand-dipped into vats of hot dye stuff by workmen whose constant watchfulness is necessary to prevent the streaking of the skein where it touches the suspending rod, nor is drying any longer accomplished by twisting the skein with a stick until the moisture is wrung out. Machinery now takes care of both operations, in the first case

dipping the yarn automatically, and in the second driving out the water by centrifugal force.

Piece dyeing and finishing form an important department, wherein all kinds of silk, silk mixed goods and ribbons are dyed in the piece and put through various finishing processes for uniformity of width and the different body and surface qualities desired. Special provision is made for ribbon goods, the processes applied including pure dye, weighted surface and warp printing.

Moire is finished and blocked.

The abundance of printed silk goods in the market is indicative of the attention paid to this phase of the color enrichment of silks. Who can imagine the deprivation were both color and design to be eliminated. A double debt is owing, then, to the textile chemists who have reproduced in dyes a thousand and one hues, as delicate or as brilliant as the colors found in art or nature, and to the dyers who have discovered the means of application and, like the National Silk Dyeing Company, have made possible the almost unlimited production of silks in profusion of rich color and design.

The National Silk Dyeing Company was organized at Paterson, N. J., where, at 5 Colt street, are located its main offices. New York salesrooms are maintained at 102 Madison avenue. Between three and four thousand persons are employed in the company's plants, and one of the sources of satisfaction on the part of the directors and employees alike has been the happy relations generally existing between the two, due in large measure to the liberal policies of the former. Hours, working conditions, and proper rewards for good service have left nothing lacking that could contribute to harmony and contentment.

Lastly mentioned, but far from least among the factors responsible for the creation and growth of this big enterprise, are the organizers and present officers. The achievement is the reflection of the business abilities of Charles L. Auger, president, whose leadership is supported by Emil Geer,

ing, vice-president; Edward F. Lotte, chairman of executive committee; Charles E. Lotte, treasurer; Frank Maass, secretary; and William H. Kearns, assistant secretary.

TURNER, HALSEY CO.

Familiar as textile men are with the Turner, Halsey Company and its fairly earned place of prominence, the corporation has only been in existence since April 1st, 1908, when Hamilton Turner and C. D. W. Halsey assumed the direction of the business at 10-12 Thomas street, New York. Mr. Halsey, who is now president, had been a member of the former J. Spencer Turner Company and had had almost a score of years experience in the textile market. Spencer Turner, the present vice-president, became associated with the corporation following the death of Hamilton Turner.

ing ducks, rope, twine and yarns—are considered to be among the best qualities procurable, and the Company do a large business in the converting line.

Others of the ten mills, principally Southern, to which the Turner, Halsey Company bear the same relation, are: the Conestee Mills, Conestee, S. C.; the Panola Cotton Mills, Greenwood, S. C.; and The Mecklenburg Manufacturing Company, Salisbury, N. C.

Under the guidance of Mr. Halsey and Mr. Turner, counting also the assistance of G. M. Miller, secretary, and William C.



The younger Mr. Turner had also been one of the J. Spencer Turner Company and knew the details of manufacturing from having acted at a prior period as assistant general manager of the international Cotton Mills.

The organization of the Mt. Vernon-Woodberry Cotton Mills, Inc., of Baltimore, Md., in 1915, of which Mr. Turner is a director, was nearly coincident with the appointment of Turner, Halsey Company as their exclusive selling agents. The former has become a potent productive factor in its field, controlling a group of mills numbering the Mt. Vernon-Woodberry Nos. One and Three, the Clipper, Meadow, Druid, Woodberry, Park, Tallassee Falls Mfg. Co., and Columbia Duck Mills. The products—cotton ducks, twills, wide drills, hose and belt-

Moore, treasurer, Turnel Halsey & Company has gained general recognition as one of the cotton goods commission houses with a big purpose behind it. Branches are established in Boston, Philadelphia, Baltimore, New Orleans, San Francisco and Chicago; agencies exist in St. Louis, Kansas City, St. Paul, and abroad, in London, Havana, Porto Rico, and Buenos Aires.

The firm has correspondents in European countries and remoter parts of the world. Indeed, Turner, Halsey Company are among those representatives of American merchandise who are making forward strides in building up the export trade in textiles. Fabrics from Turner, Halsey mills are fast becoming as well known outside the borders of the United States as they are within.

MOHAWK CARPET MILLS, INC.

McCLEARY, WALLIN & CROUSE BRANCH

Four men—J. H. Howgate, William McCleary, Samuel Wallin and David J. Crouse—all practically trained in carpet manufacturing commenced business in 1886 in a small building on the south side of the Mohawk River at Amsterdam, N. Y. A few months later fire destroyed everything they had in machinery, equipment and stock. Their insurance was negligible, but with the courage and perseverance which afterwards counted for so much in building up the business, they started anew, in a small building in the Rockton section of Amsterdam, in which vicinity the prosperous mills of today are located. The production then was

covering which had been extensively imported from England, Scotland, Germany and France. Rapid progress was made in this field, the Company taking the lead in producing these goods in this country. All of the output of its mills has from the beginning been distributed through the house of W. & J. Sloane.

The late William McCleary was president of the Company almost continuously since its incorporation. He retired from active participation in the details of the management in 1917, being succeeded by Samuel Wallin. Mr. Wallin died in December, 1917, and Mr. McCleary again took up the reins



McCleary, Wallin & Crouse Plant of Mohawk Carpet Mil's

restricted to Smyrna rugs and these were marketed through W. & J. Sloane, the famous carpet house of New York.

On the death of Mr. Howgate the firm became McCleary, Wallin & Crouse and was so incorporated in 1902. The Company then branched out into the manufacture of Axminster carpets and rugs and later constructed additional buildings for the weaving of tapestry and velvet rugs. Both branches have grown steadily from the beginning and rank in volume and merit with the chief carpet manufacturers of Amsterdam.

About ten years ago McCleary, Wallin & Crouse commenced the manufacture of Chenille rugs and carpets, a type of floor

as president and retained that position until his death in January, 1920. He was succeeded by George McNeir of the house of W. & J. Sloane who served as president until the recent consolidation of this Company with that of Shuttleworth Brothers Company of Amsterdam, at which time the presidency of the consolidation was assumed by Mr. Herbert Shuttleworth and the name of the combination became Mohawk Carpet Mills, Incorporated, with this establishment as the McCleary, Wallin & Crouse Branch. The union of these interests adds materially to the efficiency and productiveness of the plants and the increased distribution will continue through the New York house of W. &. J. Sloane.

UNION MILLS, INC.

Union Mills, Inc., is a compact organization, having a closely related group of mills, dealing direct with the wholesale consumer, and finding a ready demand for all the cotton and woolen goods they can produce. They are, from the literal standpoint, actually a union of mills. The union embraces the agencies of sale as of manufacture. Its two strong constituents are an efficient direct selling organization and a group of mills supporting it at which attention has been constantly held to the systematizing

ume of trade is done on a capital of \$4,000,-000.

Economy is made a key-note in the Union Mills, maximum production on popular priced goods being the especially sought for goal. Their ruling products are their widely sold lines on underwear—knitted underwear, and ribbed undergarments for women and children. Cotton and woolen sweaters, sweater coats, overshirts and other knit goods, are produced, altogether to the number of 50,000 dozen weekly. Four thou-



Eight Mills of Union Mills, Inc., all in New York State. (From left to right, upper row) Dept. S, Mechanicville; Gem Dept., Herkimer; Dept. M, Herkimer; (middle row) Dept. U, Hudson; Royal Dept., St.
Johnsville; Dept. W, Catskill; (lower row) Dept. H, Hudson; Dept. C, Catskill.

of all operations upon proven scientific principle.

The eight thriving mills are all situated in New York State, two at Hudson, two at Herkimer, two at Catskill, one at Mechanicville, and one at St. Johnsville. The last was the original or parent mill, the others representing periodic additions to the fast-growing prosperity of the earlier organization. The business was established in its present form in 1902 and the main offices placed at Hudson, N. Y. Increase has been rapid and steadily maintained to the present day. There is a large annual advance of about twenty-five per cent over each preceding year's sales. The present large vol-

sand operatives and helpers, Americans predominating, constitute the working force. In New York, at 377-379 Broadway, are

In New York, at 377-379 Broadway, are the Company's central sales offices, feeding not only domestic demands but markets in England, Scandinavia, South America, and countries of the near and far East.

The dynamic personality directing the organization is J. H. Reaney, the general manager, whose untiring energies have been devoted through many years to the enlarging circle of the Company's activities. His is not a disposition to seek personal credit, but he has been with the Union Mills since their beginning and is undoubtedly one of the builders of their success.

H. P. McKENNEY & CO.

In the seventy-six years of its existence, the firm of H. P. McKenney & Company has passed through several successive changes in organization, but the continuity of purpose has remained unbroken. The

clerk and assistant was William H. Mackintosh, to whom more than to any other man is to be ascribed the perpetuation and building up of an enduring record of textile manufacturing and selling. Mr. Mackintosh



WILLIAM H. MACKINTOSH

present enterprise is the inheritor of a traditionally esteemed character and maintains a strong position in the woolen goods market.

A. Tucker, Jr., established a modest business in cottons at Boston in 1843. His one

had the confidence of the trade. His judgment and knowledge of sound merchandising methods stood his associates in good stead throughout a long and helpful career which came to an end in 1911 when he was eighty-nine years old.

The evolution of H. P. McKenney & Company from early beginnings to its present form is traceable in the sequence of titles, each marking an advance toward the expansion of the firm's interests. A. Tucker, Jr., became Tucker, Newton & Mills, which was succeeded by A. Tucker & Company, followed in turn by Mackintosh, Green & Horton. The next change, that to Mackintosh, Green & Company, preceded the formation of McKenney, Field & Woodman, which gave way to the present title in 1912. The business is conducted as a partnership of which Henry P. McKenney is senior member. His associate partners are Charles H. Woodman, Carl D. Pfender, and William J. McKenney.

Three mills of historic note have sold their entire production through this firm and his predecessors since 1850. They are the A. G. Dewey Mills, of Quechee, Vt.; the Caryville Mills, of Caryville, Mass.; and the William E. Hayward Mills, of East Douglas, Mass. With growth has come, of course, inevitable additions to the producing units represented in the McKenney list of mills. Chief among them are the Bellingham Woolen Company, of North Bellingham, Mass.; the Braeburn Mills, of Beacon, New York;

the Douglas Mills, of East Douglas, Mass.; the H. T. Hayward Mills, of Franklin, Mass.; and the Schuster Mill, of East Douglas. Mass.

All of these mills manufacture a general line of three-quarter (29 to 30 in.) cotton warp cloth, in weights from five ounces per yard to sixteen ounces per yard. The clothing trades use this class of goods in great quantities. The distribution of them by H. P. McKenney & Company touches the makers of men's, youths', boys' and children's suits, pants, overcoating and mackinaw coats. They are also used extensively in the making of women's jackets, cloaks and skirts. Other articles of utility owing their fabric to the same source include gloves, blankets and blanket linings, hats and caps for both men and women, and men's shirts. The cloth as supplied by the distributors comes in all finishes, as well as in plain and fancy effects.

The latest advices from the company indicate that its affairs are in a condition presaging continued development along the successful path it has so long followed. The executive headquarters of the McKenney organization are found at 80 Fifth avenue,

New York.

H. W. BUTTERWORTH & SONS CO.

A century ago, when George Stephenson was figuring how he could coax more than six miles an hour out of his locomotive, John Butterworth, founder of this firm, started

Today we look back and find that during that hundred years, H. W. Butterworth & Sons Company has been foremost in the manufacture of finishing machinery that



JOHN BUTTERWORTH

making history in the textile world. Equipped with just as much knowledge and as many ideas about his business as Stephen-



HARRY W. BUTTERWORTH

meets the demands of modern mills. One of the land-mark institutions of Philadelphia is the great group of buildings, where many



HENRY W. BUTTERWORTH

son had about railroading, he began specializing in textile finishing machinery and directing untiring energy to the production of devices to save man-power in this industry.



JAMES EUTTERWORTH

of the important machines which today are found in every leading mill of the textile trade were developed. The idealistic policy, which has been the foundation of the succesful Butterworth enterprise is, that conscientious maintenance of dependable service, business and manufacturing methods will make lasting friends and will win an enviable reputation for its adherents.

The greatest skill and inventive genius of the Butterworths, combined with the services of able experts in all branches of the business, have been evolving and constructing the new devices and the new methods to meet ever-changing conditions and demands. For instance, there was the Butterworth machinery for mercerizing. It was the first ever made in America. It came to be known as such good machinery that today there are very few mills in this line that can get along without it. This is only one illustration to indicate in what large measure the textile industry for so many years has relied on the Butterworths to solve finishing machinery problems.



The Original Factory

In those early days advertising was not the powerful lever in business that it is today. Not all men who had something to sell believed in advertising. But John Butterworth did, and so did Henry W. Butterworth, who took over the business in 1841. These pio-

neers wrote their own "ads." While seeming crude, compared to those of the present, they no doubt accomplished their purposes then. Here is one quaint sample, as it appeared in the public prints.



This advertisement, in which the punctuation then in vogue is reproduced, was issued from No. 90 Market street and 444 North Second street, Philadelphia.

The original factory was in the rear of 444 North Second street and in 1850 was removed to 29 and 31 Haydock street, in that city. A squat, two-story building was this first stand of the Butterworths, known as the Eagle Machine Tin Plate Works. It was in striking contrast to the big plant now in operation with an army of employees and equipment that is the last word in mechanical skill and efficiency.

The greatest expansion of the firm dates from 1889, as H. W. Butterworth & Sons Company. The officers and directors are; Harry W. Butterworth, president; Henry W. Butterworth, vice-president; Albert W. Butterworth, treasurer; and J. Warner Butterworth, secretary; and James Butterworth, Charles C. Butterworth and William B.

Butterworth.

CHEMISTRY: THE MENTOR OF THE TEXTILE INDUSTRY

By DR. H. C. EMERSON

Director of Emerson Laboratory, Springfield, Mass.

How the laboratory works in close conjunction with the loom is, to the general public, still an unknown chapter in modern industrial development. The textile manufacturer, however, is quite ready to admit that chemical investigation has removed much of the hit-and-mystery from the fabrication of silk, woolen and cotton products.

Striving for a uniform and standardized line, the textile mills must, nevertheless, make use of raw materials which frequently develop wide variance in character and quality. Such conditions cannot be satisfactorily adjusted to meet the demands of production by mere superficial investigations. It is the textile chemist who must make an accurate diagnosis of the "complaint" and outline a practical course of chemical control. He is, in reality, a business doctor, upon whose correct findings and indicated treatment the life and financial health of a great business often depends.

The recent war did much to emphasize the indispensable part which chemistry plays in the entire realm of manufacture, and the textile mill affords a very striking example of "chemical affinity" in industry. It might seem to the uninitiated that here was purely a mechanical process; yet at every turn, in every operation, chemistry lends a hand in assisting production, improving the product

and reducing costs.

Let us consider briefly the textile operations which call for chemical knowledge. In the sizing of yarns there must be a careful selection of suitable substances for binding, lubrication, weighting and the production of a good working thread. In the bleaching department, the removal of foreign matter and the necessary whitening without weakening of fiber, is a chemical process from start to finish. In dyeing, the standardization of colors calls for the most accurate tests. The exact variation in the strength of colors is only discoverable by chemical investigation. In the various finishing processes, chemical compounds make or mar the saleability of the fabrics. Under different trade names, a wide range of pastes, salts, greases and starches are offered to the manufacturer. Some of these have merit; many are useless; others are positively harmful. It is only the laboratory analysis that can get down to first principles and intelligently pass on the value of such finishing com-

pounds.

Throughout all textile manipulations, soap appears as an item of great importance. Soap sounds like one of the elements of nature, yet there is a greater range of ingredients in soap than in any other single compound. When soaps are secured that exactly meet the purpose for which they were created, they should immediately be analyzed for future standardization.

Possibly all the points mentioned have been successfully solved by the maker of textiles. Yet there arises the most difficult and apparently most inexplicable problem of all. Having followed established formulas and practices, the unexpected happens, something goes wrong,—stains which cannot be accounted for, damaged fabrics which develop complaints when in the hands of the consumers. Here the trained chemical investigator is invaluable, and experience has shown that he is usually able to locate the trouble promptly and definitely.

The advantage which a consulting chemist has in work of this nature, as compared with the mill chemist is obvious. The public laboratory is a clearing house for all manner of manufacturing difficulties. The accumulation of exact data and the wide experience in every line of chemical investigation, makes it possible for the public service laboratory to supply promptly, information which an individual chemist would be obliged to spend weeks or months securing.

The Emerson Laboratories have on their staff chemists who are experts in straightening out textile tangles. Manufacturers may feel free to consult with these men at any time. Very often seemingly difficult problems are in reality quite simple; while it must be confessed, some apparently trivial troubles at times prove to be the most com-

plex.

In any event,—"it pays to analyze!" For any mistakes in a textile mill are soon multiplied to proportions that may seriously impair both reputation and earnings. The only safe practice is to be chemically certain at every stage of production. The services of the industrial chemist can no longer be regarded as an occasional "luxury"; he has become the indispensable mentor of modern manufacture.

SAMUEL HIRD & SONS, INC.

About the year 1893, James Roberts erected the original buildings where the mill of Samuel Hird & Sons now stands. He came to Passaic from Philadelphia where he had been engaged in the manufacture of dress goods with Wm. Reed & Co. Mr. Roberts idea was to manufacture mohair and lustre wool cloth and to have his factory in the immediate proximity of the selling market. Four years later he died very suddenly and the property was purchased by Samuel Hird, who was at that time engaged in the yarn business in The new owner did not, Philadelphia. however, continue in the manufacture of lustre wool dress goods but changed the machinery to that suitable for the manufacture of serges and clay worsteds. In this line he proved very successful and it was not long before the plant was increased from its original capacity of seventy looms to that of one hundred and eighteen looms. Spinning was added and dyeing and finishing to compensate for the increased loomage. About that time blue serges became more popular and the entire production of the plant was devoted to the manufacture of all worsted blue and black serges.

In 1908 the business was incorporated under the firm name of Samuel Hird & Sons, with Samuel Hird, president; S. A. Hird, treasurer; and H. E. Hird, secretary. They engaged in the manufacture of serges and gray mixtures for the women's wear trade, and at this time the plant was rebuilt and more machinery added.

In the spring of 1911 they put out for the men's wear market the first vigoureux mixture cloth ever made in a popular priced fabric in the United States. A fabric of this construction had previously been made only in very fine goods, so that this innovation caused a great deal of comment. From that date the firm has devoted practically its entire attention to the manufacture of vigoureux mixtures.

In the fall of 1914 they established their own New York office, selling merchandise

direct instead of, as previously, through selling agents. When war was declared with Germany in April, 1917, they were among the first to offer their plant for the use of the government and in May of that year they were awarded a contract. By the end of June they were shipping 20-oz. clive drab to the Depot Quartermaster at



SAMUEL HIRD

Philadelphia. From that time on, for the duration of the war, they devoted practically their entire attention to the manufacture of this cloth for the War Department. At the present time they have materially enlarged their production by putting in considerable more spinning and weaving facilities, so that the plant has upwards of fifty thousand yads a weel: production of vigoureux mixture fabrics.

PASSAIC PRINT WORKS

The Passaic Print Works, of Passaic, N. J., was established in 1877 through buying at auction by the creditors of the small printing plant known as Lockes Mill which had been built in 1874 and closed down through failure in 1876.

The new company started with small buildings, poor steam power, and an equipment of second hand machinery. There were five printing machines capable of printing single and two color work in fugitive colors. The plant was out of town and

black, indigo blues, reds, and wines, are handled. A napping room with the most improved napping machines, and a tenter frame room with ten tenter frames, are other features of the equipment. A big modern storehouse, with a capacity of 10,000 cases of goods, was built in 1907 as an adjunct to the plant and is operated as the Warehouse Company of Passaic. The Erie Railroad has a spur running into the mill yard and all goods are delivered or shipped direct from the cars without rehandling.



Passais Print Works

a half a mile from the Eric Railroad. Every bale of cloth and all coal and materials had to be carted in, and all finished product carted out.

Handicapped as it was, the new company succeeded from the start. It adopted the wise policy of putting back into the Works most of the earnings. In this way, during a period of forty years, the Works have not only been entirely rebuilt but increased many times in size.

At the present time the Print Works has fifteen printing machines, which are suitable for printing the best grade of fabrics and in fast colors. There is a large and well equipped dye house in which aniline

Commencing October, 1915, the basis on which the Print Works had previously been operated was changed from printing goods for its own account to the safer and more modern policy of printing for the converting and manufacturing trade—cloths consigned, and at an agreed price per yard, for printing and finishing.

The record of the Passaic Print Works is something of which those who have managed the property are proud. The officers of the corporation are: Edward E. Poor, president and treasurer; P. F. Cole, vice-president; Henry A. Berry, secretary; and Edward E. Poor, Jr., assistant treasurer. New York offices are at 320 Broadway.

NATIONAL ANILINE AND CHEMICAL CO.

This Company was founded to provide America with a great dyestuff industry. Its predecessors were the pioneers in American color production. The war brought not only the opportunity but the necessity for the development of this accumulated experience. Upon this experience has been built a structure in personnel and in equipment not exceeded by any European works.

The obligation resting upon them during the war was to produce quantity. The emergency needs of the government and of the textile industry demanded first attention and the building of immense plants had to go on hand in hand. Today they are producing some 102 intermediate products and over 300 different colors. Type for type these products are as fine in quality as any ever imported.

Out of the Research Department must come the future progress of the Company. Its past years of steady upbuilding and devoted service will become evident as better and newer types advance into the semi-manufacturing and ultimately to the full manufacturing scale of production. The management is well acquainted with the needs of the country by reason of years of service which its selling units have devoted

to the textile industry, and the research which it undertakes is dictated in the interest of the textile user.

Primarily and logically, the American coal-tar color industry is a servant of the great American textile manufacturers, whose annual product runs into the hundreds of millions. It is the needs of the great army of textile consumers which this Company serves. It is the voice of the textile manufacturer to which they listen. It is because the great American investments in textile manufactures must be insured against loss for all time, that an American dyestuff industry has been born to serve the government with explosives for war, and with colors for textiles and allied industries in both peace and war.

The National Aniline and Chemical Company, Inc. with its main sales office at 21 Burling Slip, New York, shown on Page 204, and branch offices at Akron, Boston, Charlotte, Chicago, Hartford, Philadelphia, Providence, San Francisco, Montreal, Toronto, and its plants at Buffalo, Brooklyn, and Marcus Hook, Pennsylvania, shown on Page 205, is equipped to meet the tremendous demand for dyes this country's textile

interests are pouring in upon it.



Main Office of the National Aniline and Chemical Company



Plants of the National Aniline and Chemical Company

DAVIS & FURBER MACHINE CO.

The Davis & Furber Machine Company of North Andover, Mass., was established in 1832.



GEORGE GILBERT DAVIS.

Treasurer and Leading Spirit of the Davis &
Furber Machine Company until his Death in 1920.

The firm name, originally Sawyer, Phelps & Company, in a few years became Gilbert,

Gleason establishing the woolen mills in Gleasondale, Massachusetts, left Mr. George L. Davis alone in the business. Mr. Davis took in as a partner, Charles Furber, and the name became Davis & Furber. Mr. Furber died in 1857; his place was taken by Mr. Joseph M. Stone and Mr. John A. Wilev.

A few years after the death of George L. Davis his place as treasurer was taken by his eldest son, George Gilbert Davis, who, from that time until his death in 1920, was the leading spirit of the Company. Under him the works more than doubled in extent.

The original object of the founding of the Company was to manufacture carding and spinning machinery, and this has been the principal business for almost 90 years, During that time they have furnished the larger part of this machinery sold in the United States.

As time went on and the demand increased the Company took on the manufacture of card clothing, nappers, pickers, dusters, winders, spoolers, and various other textile machines.

It is the largest industry of its particular line in the United States. Its equipment is complete to manufacture from the raw material to the finished product, thus reducing costs by eliminating the profits of intermediate dealers. It controls a large num-

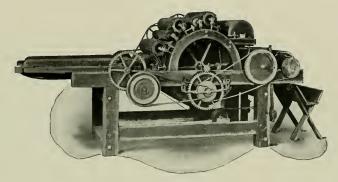


PLANT OF THE DAVIS & FURBER MACHINE COMPANY

The Davis & Furber Machine Company has grown steadily from one two-story wooden building in 1832 to this modern plant containing fifteen acres of floor space.

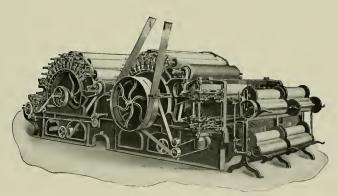
Gleason & Davis. Mr. Gilbert later founding the large George H. Gilbert Mfg. Company of Ware, Massachusetts, and Mr.

ber of houses for the employees, which are well kept, and add much to the beauty of the town.



THE SCHOLFIELD CARD

Reputed to be the first woolen card erected and run in this ccuntry. Put together by the Scholfield Brothers over one hundred and twenty years ago. Run in Byfield, Mass., Nashua, Jaffrey and Marlboro, N. H., a total of nearly one hundred years. Now owned by Davis & Furber Machine Company. Compare it with the mechanical excellence of a modern set. Then estimate the probable length of life of the cards made today.



DAVIS & FURBER CARD

This modern double finisher wool carding machine 60x60 is one half of "a set of cards." The set weighs eighteen tons as compared to 1025 pounds, the weight of its Scholfield ancestor.

FRANK B. GRAVES CO.

Mr. Frank B. Graves established this business in 1882, and in 1912 it was incorporated under the name of the Frank B. Graves Company, dealers in cotton and



FRANK B. GRAVES

wool waste and shoddies and manufacturers of garnetted stock of all kinds. At the present time it is among the leaders in the trade. In addition to a handsome volume of domestic business the Company is developing its exports branch, a new departure, and all signs point to a very busy and prosperous future.

Starting at 14 Bleecker street, Albany, N. Y., in a small two-story building, Mr. Graves made rapid progress and took up larger quarters at 48-58 Broadway, in a four-story building occupying an entire city block. This larger place finally proved inadequate to his needs, and in 1908 he moved again, this time to the present location at Church and Arch streets, Albany, retaining the Broadway property for warehouse purposes.

At this time the business was expanding along the line of cotton and wool substitutes. The demand for these materials increased to such an extent that the need of a separate garnetting plant was realized; so in the year 1912 the Enterprise Garnetting Company, of Cohoes, was organized with Frank B. Graves as its president, to manufacture cotton, wool, silk and merino garnetted stocks solely for the Frank B.

There were only six four-cylinder garnetts in the beginning, but the venture

Graves Company.



Main Office of Frank B. Graves Company, Albany, N. Y.

yielded such good returns that the garnetting facilities were increased until there are now eighteen four-cylinder garnetts running 144 hours a week and producing 8,000,000 pounds a year. This increased production in turn created the need of more storage, with the result that in 1918 the Commercial Storage Company, of Cohoes, was formed. It occupies one of the



Mills of Frank B. Graves Company, Cohoes, N. Y.

largest and best modern fireproof storage warehouses in the city.

The outbreak of the war in 1914 brought a rush to the United States of buyers of munitions for foreign governments. Among the supplies required were absorbent and non-absorbent cotton for use in surgical dressings. This demand opened wide the door of opportunity for the Frank B. Graves Company, which sold large quantities of this essential product, and later, when the United States entered the conflict, the entire plant of the Enterprise Garnetting Company was used for this one purpose. The total number of pounds turned out ran into the millions.

While the cessation of hostilities eliminated this end of the business, the company continued to produce a good grade of absorbent cotton for hospital and general uses. The principal business of the company, however, continues to be that of dealing in a full line of knitting, hosiery, underwear and woolen mill waste of every description and the manufacture and sale

of garnetted stocks in cotton, wool and mixtures of cotton and wool for all lines of textiles.

Mr. Graves has built up a capable and harmonious working organization, to whom no small degree of the success of the various companies is due. Mr. Walter J. Mooney, vice-president and treasurer, has been associated with Mr. Graves since 1910 and is now assistant manager of the three corporations. Mr. E. B. Parkhurst, the secretary, has been associated with the Company since its incorporation and with Mr. Graves for twenty-five years. The executives of the Enterprise Garnetting Company, besides Mr. Graves and Mr. Mooney, are James F. Kearney, secretary, and Mr. George C. Angus, treasurer, and of the Commercial Storage Company, Charles A. Van Wormer, secretary, and Mr. Thomas S. Scanlon, treasurer.

The Company has a New York City office at 200 Fifth avenue, in charge of Mr. Frank H. Decent, and either Mr. Graves or Mr. Mooney make it a point to be at the exec-



Storehouse of Frank B. Graves Company Cohoes, N. Y.

utive desk in New York every Wednesday. A full line of samples is kept constantly on hand. The latchstring is always out, with the facilities of the office at the disposal of the trade in general.

A. W. HARRIS OIL CO.

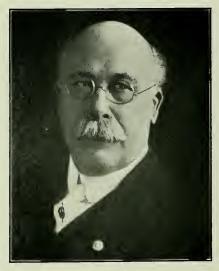
The avowed policy of the A. W. Harris Oil Company when it was founded, in 1884, was to manufacture and market a line of special petroleum lubricants that would be of the highest possible quality. Its purpose has been carried out by nearly forty years of successful manufacturing during which it has forged steadily forward, adhering to its original purpose and making friends, among others, with the textile mills. The company's product has been drawn upon heavily for textile uses, having become rec-



A. WALTER HARRIS Owner of the A. W. Harris Oil Co., for Many Years until his Death in 1912

ognized as admirably adapted to give the particular results desired in the mills.

The men who made the announcement first referred to were Abram Winsor Harris and his son, A. Walter Harris. The former and his father, Elisha Harris, made a niche of their own in the textile history of their day. Both were connected with the industry in North Adams, Mass., and they invented and patented a ring spinning frame involving principles then entirely new. Abram W. Harris subsequently served in the engineering departments of several large textile mills. After passing the Civil War period as a first assistant engineer in



BENJAMIN S. TERRY Late President of the A. W. Harris Oil Co.



GEORGE F. HEYWOCD President of the A. W. Harris Oil Co.

the U. S. Navy, he became associated with his brother, William A. Harris, builder of the Harris-Corliss engines, that were installed generally in industrial plants through-

out the country.

Abram W. Harris established The A. W. Harris Oil Company at 326 South Water street, Providence, R. I., where the head offices are still situated. His son, who was his partner from the inception of the enterprise, succeeded him a few years later and continued as the sole owner until the date of his death in June, 1912. The new management, the present officers, were all engaged in the firm almost from its foundation. The company was incorporated in Rhode Island, and has a capital stock of \$75,000, all paid in. George F. Heywood is president; Arthur Duncan Greene, treasurer; and Francis X. Steffy, secretary. Benjamin S. Terry, who preceded Mr.

Benjamin S. Terry, who preceded Mr. Heywood as president, died July 13, 1920. The A. W. Harris Oil Company has a branch at 22 East Washington street, Chicago, Ill., and carries warehouse stocks in Washington, D. C.; Kansas City, Mo.; and

Denver, Colo.



ARTHUR DUNCAN GREENE
Treasurer of the A. W. Harris Oil Co.

MANHASSET MFG. CO.

The interdependence of industries links the textile mill to forms of production, at first thought, outside of the domains of wool and cotton. In the conjunction of dissimilar materials composing the automobile tire a hidden but indispensable part is the fabric, the foundation of the tire's structure. With the yearly increasing numbers of motor driven vehicles, the consumption of tire fabric has assumed proportions taxing the resources of the mills specializing in its manufacture. Though the industry's total production is huge and the competition keen, a conspicuous measure of success has been won by a firm incorporated as lately as 1911.

The Manhasset Manufacturing Company, in the eight years of its existence has increased its capital from \$250,000 to \$2,700-000, has arrived at an annual turnover of \$8,000,000, an increase of more than 100 per cent over early records, and exhibits the characteristics of a financially sound and progressive business. The present officers of the corporation who were also the incorporators

are: E. V. Livesey, president; H. J. Thayer, secretary; and R. H. Ballou, treasurer and general manager. The sole product of the Company is tire fabric but in the making of this it has conformed to high standards and won general recognition for a superior fabric. In the mill at Putnam, Conn., the yarns are spun of Egyptian and Sea Island cotton, and machinery of the most improved design completes the process of manufacture. Two hundred and twelve looms, 16,000 ring spindles, and 15,400 twister spindles are part of the equipment.

Contentment reigns at the Manhasset mill. Between the 850 employees, predominantly French and Polish in nationality, and the management the best relations have always prevailed. Happy is the manufacturer who is not beset by labor troubles. In this respect and many others the Manhasset Manufacturing Company is placed in a fortunate position for continued growth and prosperity. The business address of the Company is Providence, R. I., where selling offices are maintained at 1406 Turks Head building.

CONE EXPORT & COMMISSION CO.

A new impetus and direction was given to cotton manufacturing in the southern States by the genius of the late Moses H. Cone, who, together with his brother, Ceasar Cone, in 1890, formed the Cone Export & Commission Company, of Greensboro, N. C., and 61 Worth street, New York City.

Prior to that time, the mills of the South had confined their activities to very coarse



MOSES H. CONE

numbers and made little else than common plaids and cottonades. They paid little attention to style or finish, catered almost exclusively to local markets, and made no attempt to branch out or compete in the larger fields which were left free to eastern competitors.

The Cone Brothers, whose earlier career as wholesale grocery merchants had given them a wide and intimate acquaintance with conditions in the southern States, were quick to recognize and take advantage of the situation.

Accordingly, they formed their own commission company, built a finishing plant at Greensboro, organized a number of new mills on lines hitherto untried in the South, financed the older mills and diversified their products, until today there is no line in the entire dry goods schedule in which the South is not favorably represented.

The present officers of the Cone Export & Commission Company are: Julius W. Cone, president; Saul F. Dribben, vice-president; Clarence M. Guggenheimer, treasurer; L. H. Sellars, secretary; Frank Leak, assistant secretary; and Herman Cone, assistant treasurer.

The Proximity Manufacturing Company was founded at Greensboro, N. C., in 1896 by the late Ceasar Cone and his associates. There were then 200 operatives employed and 240 looms and 10,000 spindles. Today there are 1200 operatives, 1600 looms and 53,000 spindles.

lt was in 1899 that Mr. Cone, Mr. E. Sternberger, and associates opened at Greensboro the Revolution Cotton Mills with 300 looms and 10,000 spindles, since increased to 2040 looms and 70,000 spindles, and employing 1000 operatives. But the most noted of the Greensboro group of mills founded by the Cone Brothers was the White Oak Mills, whose erection, begun in 1903, consumed two years. This plant covering more than sixteen acres of floor space contains 3000 looms and 61,000 spindles and gives employment to 1500 operatives. The White Oak Mills afford in many respects a typical example of the ethical standards and manufacturing ideals initiated by the Cone Brothers and maintained with steadfast fidelity to the original plan.

Only thorough co-operation and harmony between employers and employees could have made these mills the highly productive unit they are and have created the happy living conditions enjoyed by the workers. The material welfare of the community is promoted in a practical way by an organized department having the widest latitude allowed it for its endeavors. Free graded schools are supported in each village and 1250 children are enrolled in them. Homes that are attractive, lighted with electricity and modern in all details, are rented by the company at three dollars and six dollars per month. The size of the plots, 75 x 150 feet, allow each householder to have his own truckgarden. Fruit trees on every lot, and

shade trees along the street, well-kept roads and sightly grounds, are other reasons for the workers' contentment. A band and baseball teams, recreational clubs for both sexes, a mutual benefit association, district nurses, and periodic medical attention, are all part of the social scheme.

What has all this to do with cotton goods manufacturing? The answer is in the White Oak Mills, in their smooth running production, the efficiency of their operators. From the opening and picking department, on through the carding department, to the spinning room where 504,000,000 yards of yarn are spun daily, to the beaming and slashing department, then to the weaving department whose 3000 looms produce sixty yards of cloth a day per loom as against the five yards of the old hand loom, and finally to the finishing and shipping rooms—these and still other sub-divisions of the manufactory are conducted according to the best standards, not only as to the mechanical perfection of processes but also as affecting the human element. As cleanly and inviting as are the villages, they are no more so than the mills.

The Proximity Print Works is the latest addition to the Proximity group of plants, and is the first general converting and textile printing plant to be successfully established in the South. It began business in 1914, but during 1920 and 1921 has been greatly improved and enlarged. Its principal products are indigo bleached printed fabrics such as drills and shirtings for work clothes; khaki, and bleached and printed art bed tickings. Probably a line of fast colored printed shirtings and percales will be added later. This plant is equipped with the latest and most highly improved machinery and is modern throughout. Its capacity will be about 150,000 yards per day. The Proximity Manufacturing Company, in their various plants, are the largest individual consumers of indigo dye in the world, using more than one-third of the entire consumption in the United States.

The system of four mills, of which the White Oak Mills are one, takes the raw cotton from the farms and gins and turns it into finished cloth at the rate of 520,000 yards per day. Allowing three yards of cloth to a garment, this represents the material for 173,333 garments per day, or 52,000,000 per year. The Proximity Print

Works, Proximity Manufacturing Company, Revolution, and White Oak Mills, manufacture denims, indigo drills, khakis, printed shirtings, outing and canton flannels. These mills have been here described merely as illustrations of a larger group comprising twelve mills, all represented by the Cone Export & Commission Company. The others and their products are: The Asheothers and their products are:



CEASAR CONE

ville Cotton Mills, Asheville, N. C., chambrays and cottonades; Cliffside Mills, Cliffside, N. C., staple ginghams; Dacotah Cotton Mills, Lexington, N. C., chambrays; McAden Mills, McAdensville, N. C., outing flannels, chambrays and plaids; Minneola Manufacturing Co, Gibronville, N. C., outing flannels; Salisbur / Crtton Mills, Salisbury, N. C., tickings and chambrays; Sidney Cotton Mills, Graham, N. C., plaids; Eno Cotton Mills, H'llsboro, N. C., chambrays, shirtings and hickorics; Ha nes Mills, Cliffside, N. C., ginghams.

Both Moses H. Cone and Ceaser Cone have passed on—Ceasar Cone died March 1, 1917—but they built secure foundations and left an organization which has not pauced in the fulfilment of its appointed tasks

GARFIELD WORSTED MILLS

The Garfield Worsted Mills of Garfield, New Jersey, began business in 1902 with a capital stock of \$125,000, and a plant consisting of a weaving mill of 150 looms.

At the present time it has about 1000 looms in operation, and in addition, dycing and finishing plants, power and other units required to properly handle the largely increased production.

The officers of the Company are: Anton Schmid, president and treasurer; John H. Love, first vice-president; T. H. Lamprecht, second vice-president; and William M. Kennard, s-cretary. The present capital stock is \$3,750,000.

The product consists of fine all-worsted serges, gabardines, tricotines, all-wool velours, and similar high-grade woolen and

worsted dress goods for women's wear, the mill having earned a foremost reputation for excellence of fabrics of this character.

The location of the mill in a well established textile community about twelve miles from New York combines advantages in delivery and shipping facilities and in availability of labor accustomed to the textile industries.

Under normal conditions the mill employs about twelve hundred men and women. In matters looking to the progressive improvement of the working and living conditions among its employees, no less than in the matter of maintaining and increasing the excellence of its product, the Company has evidenced its intent to maintain the standards of the best of modern mills in this industry.



Garfield Worsted Mills, Garfield, New Jersey

MINOT, HOOPER & CO.

The name Minot, Hooper & Co., is about as familiar in the great Worth street district in New York as is the Declaration of Independence in the country at large; and as dry goods commission merchants the firm stands high both in reputation and volume of business.

Minot & Hooper had their beginning in 1840, in Boston, as East Indian merchants, importing silks and tea from China. In the late seventies the business took over the selling agency for domestic mills in the textile field. A few years later there was organized the partnership which laid the rock-ribbed foundation for the large and prosperous business carried on by

the house in New York City and Boston today.

Minot, Hooper & Co., are selling agents for the Great Falls Manufacturing Co., the Dwight Manufacturing Co., the Lyman Mills, the Harmony Mills, and the John P. King Manufacturing Co.

The present partners are Thomas W. Slocum, L. William Horr, George Nichols, Robert W. Newell, George Linton, William B Nichols, Clarence Horr and John Bowen. They learned the business from the ground up, all of them having been employees of Minot, Hooper & Co., before attaining to their present distinguished positions as the heads of this old established house.

CHELSEA FIBRE MILLS

In 1880 there were only four manufactories of jute fabrics in the United States. Of these four original mills, one was the Chelsea Jute Mills, organized during the early 70's and incorporated in 1876. A beginning was made on jute bags. The original plant became too small and a larger location was found on Eleventh avenue, Twenty-fourth to Twenty-fifth streets, New York. These mills then manufactured linoleum foundation, burlaps, jute carpets, bags, jute carpet yarns, and binder twines for harvesting machines. Again, in 1889, the influx of orders necessitated a complete mill structure allowing for

A complete modern dispensary gives them free medical treatment, and every employee is the recipient of a free life insurance policy for the protection of his dependants.

The Chelsea Fibre Mills performed its part to meet the exigencies of the world war. In those days the plant was engaged to the limit of its capacity in manufacturing supplies and equipment for the United States and allied armies and navies. Since resuming its normal activities the output of the plant has consisted principally of jute and hemp carpet yarns, jute yarns and roves for electric cable insulations, jute burlap and canvas, jute and



Chelsea Fibre Mills

enlargements. During the following year the Company moved to their present home.

The mills, situated on the water front of the Greenpoint section of Brooklyn, at 1155 Manhattan avenue, employ 1500 workers. After 1900 the plant was enlarged to cover the entire block between Commercial street and Newton creek. New equipment was installed for the making of polished twines and ropes, and electric motor power was substituted for steam. As hemp fibres came to be used, as well as jute, the old title of the mill, the Chelsea Jute Mills, was changed to the Chelsea Fibre Mills.

The welfare of the employees is as zealously guarded as any of the owner's interests. hemp carpets, twines and cords, seamless bags, and plumbers' and shipbu'lders' oak-um.

The Company has recently started an erganization in Calcutta, India, with the idea of supervising the baling of the jute and of improving the quality of the product.

Throughout its history the Chelsea Fibre Mills has been under the direction of members of the Pratt family of Brooklyn. The present officers are: Frederic B. Pratt, president; Paul T. Wise, vice-president and general manager; Herbert L. Pratt, treasurer; and Harold I. Pratt, secretary. The Company has New York salesrooms at 212 Fifth avenue.

THE CLEVELAND WORSTED MILLS CO.

Known throughout the world for the quality of its products, The Cleveland Worsted Mills Co. well deserves the high place it has occupied for many years in the great American textile industry. Born in 1878 at Kent, Ohio, of healthy parents and incorporated in Ohio, January 11, 1902, under its present name, it has been distinguished from its very inception for a safe, sound and progressive policy, which stands out conspicuously today as a monument to the business greatness of those men upon



OLIVER M. STAFFORD
President of the Cleveland Worsted Mills Co.

whom has rested responsibility for its upbringing.

With an authorized capital stock of \$20,-

000 000, mills going full blast every working day in the year and 5,000 people to operate them, this industrial giant of the metropolis of the Buckeye State sends its worsted yarns and worsted fabrics for men's and women's wear to purchasers throughout the length and breadth of the United States and Canada and into practically every other

and Cinada and into practically every other civilized country. Moreover, there is a steady, year-in-and-year-out demand for them.

Every successful man has his own convictions in explanation of his success, and in the case of The Cleveland Worsted Mills Co., all members of the firm agree on this point; they say that their products sell the way they do because every man of the selling organization is commanded to look the customer squarely in the eye and say, "Look at the Cloth," and that this injunction having been heeded and the order placed, the Company sees to it that the merchandise itself is as good as the sample, if not better. There must be something in this, for the books of the Company attest to a 100 per cent increase in the volume of business of recent years.

Prompt deliveries—and prompt collections—are quite as important in the Worsted Mills Company book of rules as the

challenge, "Look at the Cloth."

In point of trade advantages the Company is specially favored, due to its geographical location; it is a natural center for water, railroads, coal and wool. All of its mills were established with a view to this important factor. The subsidiary names under which these mills are operated and

their location follows:

The Cleveland Worsted Mills Co., Cleveland, Ohio; The Annevar Dyeing & Finishing Works, Ravenna, Ohio; Redfern Worsted Mills, Ravenna, Ohio; Odsonia Worsted Mills, Jamestown, New York; Rowland Worsted Mills, Philadelphia, Pennsylvania; The Langford Worsted Mills, Providence, Rhode Island; Ferncliff Worsted Mills, Jamestown, New York; Fern Rock Woolen Mills, Providence, Rhode Island; Salisbury Worsted Mill, Camden, New Jersey; and the Vulcan Combing Works, Philadelphia. The Company also owns the Lake Hodgson Water Works in Portage County, Ohio.

One of the many fine things about The Cleveland Worsted Mills people is the en-

One of the many fine things about The Cleveland Worsted Mills people is the entente cordiale existing between Company and employees. This is festered to a large degree by painstaking and intelligent attention to the physical and social welfare of the workers and the opportunity to the workers

to acquire stock in the Company.

As those in the textile industry and outside of it are fully aware, these considerations should be taken into account, and in the practice of its own service policy The Cleveland Worsted Mills Co. finds its employees out in the factories highly appreciative. This appreciation is demonstrated in concrete form in the way of efficient and enthusiastic service. As the slogans of The Cleveland Worsted Mills Co. are "Hard

Work" and "Look at the Cloth," such a response is especially gratifying to the firm, all of whom work hard themselves. Oliver M. Stafford is the president; Geo. H. Hodgson, vice-president; O. B. Greene, secretary and treasurer; and J. W. Bolton, general superintendent. In addition, the directors are Daniel K. Bailey, C. G. Bentle, H. Moss, F. F. Stafford.

The Company operates sevent v-six worsted cards, sixty-three worsted combs, 161,000 worsted spindles and 1,700 broad looms. Of special interest as indicating its development from the early days, when all it made was cotton warp goods, is the increased capitalization in the last six years. On March 25, 1914, this was increased from \$3,000,000 to \$10,000,000 and on March 13, 1918, from \$10,000,000 to

GEORGE H. HODGSON

\$20,000,000.

Mr. Hodgson's case illustrates how far work combined with an understanding of the business in hand in all its details and ramifications will take a man who possesses these necessary qualifications. Back in 1890 he started out as a designer and superintendent. He made the first piece of all worsted goods in Cleveland. This was the nucleus of a great development and immediately gave him a fixed place in the textile industry.

George H. Hodgson comes of English stock, and began his active business career with B. Priestly & Co., of Bradford, England. His father, Frederick Hodgson was manager of a woolen mill in Yorkshire in 1860. Thus from his earliest recollection George H. Hodgson heard talk of what was going on in the textile world, and almost as soon as he was able to think for himself he resolved to go into this industry and

make a mark for himself. His ambition has been realized during his affiliation with The Cleveland Worsted Mills Co., which



GEORGE H. HODGSON
Vice-President of the Cleveland Worsted Mills Co.

he serves not only as vice-president but as general manager.

Mr. Hodgson's home is at 1886 East Ninety-third street, Cleveland, Ohio, the headquarters city of the Company. He is a member of the Union Club, Athletic Club and Roadside Club, all of Cleveland, the Cleveland Chamber of Commerce, Manufacturers Club, of Philadelphia, and Aldine Club. of New York.



Cleveland Worsted Mil's

ANDREW McLEAN CO.

When the Andrew McLean Company celebrated its eightieth anniversary in 1906 a writer covering the subject in one of the textile journals made the following state-"The Andrew McLean Company, manufacturers of finished cotton goods specialties, have grown through the long years of experience, and wonderful have been the changes from the early days, when hand labor was essential to every process, and while there have been many changes in the method, the greatest progress has been with the ever increasing development of power driven machinery. The methods of the past seem crude, but they are rich in romance and history, and formed the foundation stones of success.

Theirs has been the task to lead, and to maintain the highest standards in the production of fabrics that merited the confidence and appreciation of the trade. The very competent notice appearing at that time is even more applicable today as the Company has grown—now approaching the century mark—and is more fixed in its position as one of the oldest and ablest of the

American textile industry.

Since 1826 the name of Andrew McLean has been synonymous with progressive methods of manufacture. Four generations have contributed to the products which have been the leaders and standard for so many years. The principal products of these mills are cotton linings, crinolines, adhesive cloths, mosquito nettings, canvases, buckrams and shade cloth. Many of the products are especially made for the millinery manufacturing trade.

In a work of this character it is appropriate that some mention be made of the origin and development of this—one of the oldest and most honorable houses in the United States. Andrew McLean, founder of the present house, was born near Glasgow, Scotland in the year of 1802 Almost immediately upon reaching his majority he came

to America and settled in New York City. In 1826 he engaged in the manufacture of cotton goods-which he had learned in his native country—at 45 Charles street. Those were the days of handlooms for the weaving, and the desing and finishing of goods by hand. The original McLean shifted his plant as the center of the dry goods trade moved from place to place in those early days. During his régime he employed a large number of hand loom weavers who did their work in the basements of their own houses and one of the familiar sounds of New York streets in those early days was the rattle and clatter of these hand looms. So numerous were these weavers that they became a power even in the politics of the first half of the last century.

The first Andrew McLean died in 1852 and he in turn was succeeded by his eldest son, Andrew. At that time the business was located at 254-256 West Twenty-second street. The same sturdy methods which the Scotch lad had incorporated in his business were followed by his son. One of the great products of the factory at that period was hoop skirts which came into vogue with the crinoline craze of the late 50's and early 60's. The second Andrew McLean continued in charge with partners and associates until 1888, the business increasing under his

management many times over.

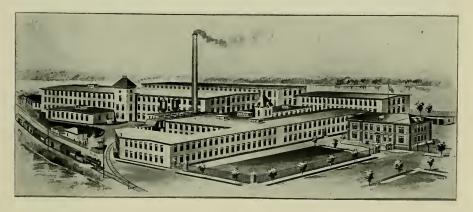
Upon his death in February of that year, the business up to this time which father and son had made so successful, was taken over by the third Andrew McLean, who in 1889 bought a large tract of land at Passaic, New Jersey, and began the erection of the mills which are operated today. After successive enlargements and improvements the plant became one of the most modern and complete of its kind in the country. Since the new mill started at Passaic many new lines of goods have been added which today are regarded as superior in their class.

In 1906 a factory, which has become one of the most successful of its kind in both foreign and domestic shade cloths, was started as an annex at 26 Great Jones street, New York. In this plant the celebrated "Victor" shade cloths are converted into window shades.

The life of this company, which has been long for America, has left in the hands of the present management many interesting relics. For instance, they have in their possession a printed list and the prices estab-

agent; and Andrew McLean, Jr., superintendent. The Andrew McLean, Jr., previously mentioned as superintendent of the mills at Passaic, is of the fourth generation and the fourth Andrew McLean in the business. George Edmund McLean, the second son of the president of the Company is also associated as a textile expert.

The company now has between 350 and 400 employees. The buildings, machinery and equipment are of the most modern; in fact, many improvements in machinery



Plant of Andrew McLean Company

lished by hand loom weavers in 1836. This shows that the weavers received more for weaving in those days than the finished cloth would cost today.

Through fires, wars, and panics the Andrew McLean Company has passed the years unscathed; its prestige became brighter and more secure with the passing of each decade. The present officers of the company are as follows: Andrew McLean, president; George McLean, vice-president; Washington Malcolm, treasurer; Andrew McLean, Jr., secretary; T. A. Williams,

now used in textile mills throughout the United States had their inception with the Andrew McLean Company. During all the years of progress of this company its manufactured products have held first rank in the trade, and have been the standard by which competition has endeavored to thrive.

Incidentally, it might be added that Mr. Andrew McLean has been honored by the citizens of Passaic, N. J., who have elected him to the mayoralty. He is regarded as one of the most benevolent as well as enterprising citizens of that prosperous city.

GRISWOLDVILLE MANUFACTURING CO.

One hundred years of manufacturing experience that have spelled so many years of service in the making of high quality products is indisputable demonstration of inherent worth. The Griswoldville Manufacturing of the control of the

the first colonies, have perpetuated the fortunes of this industry. Joseph Griswold, the founder, were he alive, could doubtless give a quaint account of the village of Colerain, Mass., and the manner in which he



Plant of the Griswoldville Manufacturing Company

facturing Company, besides being one of the oldest textile corporations in the country, manifests several characteristics ingramade his beginning there in 1820. The first mill nearby and its operators were the nucleus of Griswoldville, of which they and



Another View of the Historic Old Griswoldville Plant

tiating to the recorder of past events and continues to endure secure in its own domain.

The record typifies the stability and permanence of New England houses. Three generations of the Griswold family, whose forefathers were early English settlers in

their descendants have ever since been the main support.

The business was incorporated in 1840 under a special Massachusetts charter, with the title of Griswoldville Manufacturing Company. The Turner Falls Cotton Mills were built in 1879 at Turner Falls, Mass.,

close to Griswoldville in the same county. They were made a separate corporation, but were practically the same ownership and management as the first corporation. In 1918 the two were merged in a new corporation bearing the old title.

At the mills of the Griswoldville Manufacturing Company are employees whose grandfathers worked there before them. Four hundred and fifty workers are employed, of whom the majority are of French

Canadian extraction.

The long career of the company has been one of specialization, a concentration upon superlative quality in one general style of fabric rather than the ambition to invade kindred fields which often seizes upon the Their bleached successful manufacturer. surgical gauze is a universally used product; and their gauze bandages, crinoline, bunting, cheese cloth, long cloth, and curtain draperies, are supplied in great quantities to both domestic and foreign markets. It has been the aim of the company to give value commensurate with the price paid, insuring their own position by making certain that their side of every deal was fair. Their best advertising has been the quality of their goods.

The New York salesrooms are at 75 Worth street. The capitalization of the corporation is \$600,000. The officers are: Lorenzo Griswold, president; Frank D. Griswold, vice-president; Joseph W. Ballard, vice-president; James Bowman, treasurer; and Lorenzo Griswold, Jr., sec-

Lorenzo Griswold succeeded his father, Joseph Griswold, in the leadership of the business. He was born at Stonington, Conn., January 5, 1847. He worked be-side his father for many years, and since becoming the one in chief responsibility he has been prominent in the life of that part of western Massachusetts associated with the family name. He is known there not banker, being president of the Shelburne Falls National Bank, and a director in other business enterprises.

KILBURN LINCOLN MACHINE CO.

Supplying the tools to work with is the Kilburn Lincoln Machine Company's service to the textile industry. In business at busy Fall River, Massachusetts, ever since 1848, it has gained a reputation for reliability and fair dealing which it cherishes with pardonable pride. Its products are looms for weaving all forms of textile fabrics, power transmission machinery and grey iron castings.

The founders of the Company were Jonathan T. Lincoln and John Kilburn and the present officers are Leontine Lincoln, president; Jonathan T. Lincoln, vice-president; and B. B. Read, treasurer.

Capitalized at \$100,000, the Company's trade territory is throughout the United States and also foreign countries. There are 300 employees. One of the policies of the Company—and it has been signally successful—is to use all means in its power to the end of promoting a better understanding between employer and employed.

JOHN DUNLOP'S SONS

One of the best known houses in their line, John Dunlop's Sons, of New York City, whose product is thrown silk, have progressed to the point where their boo's show an annual turnover of \$12,000,000 to \$14,000,000, their percentage of increase since 1900 amounting to 2000 per cent. Strictly high grade Japan organzine is the Dunlop specialty and in this branch the firm has attained enviable distinction.

John Dunlop, the founder of the business, was a man possessed of all those excellent qualities which contribute to the success of a manufacturer competing with his peers, and from the beginning, in 1864, he made his influence felt in his particular field. When John Dunlop died he left three sons, fine, upstanding young Americans, who with the sterling example of their father fresh in their minds, determined to hold fast to the principles upon which the house of Dunlop had been established.

The three sons of the founder—George M. Dunlop, John D. Dunlop and Beveridge C. Dunlop—took hold of the business not as novices but as experienced manufacturers, their father with his characteristic foresight having seen to it that they received practical training in all branches.

Brought up in the village of Spring Valley, Rockland County, New York, these three sons went into the Dunlop mill there as raw recruits and learned their first lessons. In due time George M. and John D. were brought to the New York headquarters by their father and prepared for the executive duties which would come later. Beveridge C. Dunlop, the youngest of the three brothers, finally took charge of the Spring Valley mill, and in the capacity of general manager has charge of this mill at the present time.

Thus, when John Dunlop passed away his heirs were eminently qualified to assume direction of affairs. The name Dunlop was already known everywhere in the silk industry, and the brothers, ambitious and alert, set themselves to the task of doing their share in their time and generation. In this they have succeeded marvelously well.

Standing out in the record of achievement of these young men is what they have accomplished in the production of competitive Japan organzine of the highest possible quality to possess uniformity and dependability, something that had been almost un-

known in their line. To this end John Dunlop's Sons have spared neither time nor financial outlay. They set up a laboratory, which is maintained at considerable expense, through which, together with special buying arrangements with the importers of raw silk and filatures in Japan, they obtain the best raw silk procurable.

Incidentally, Mr. Dunlop went to Japan early in the year 1920 to make first-hand measure up to the high standards of throwing which the firm has established. As Mr. George M. Dunlop said to the writer, it has been the Dunlop purpose to have the name of "John Dunlop's Sons" in the trade synonymous with high quality organzine. "And this," added Mr. Dunlop, "we believe has been the main factor in our success."

lncidently, Mr. Dunlop went to Japan early in the present year to make first-hand arrangements for his firm's growing needs of the raw product and filatures. First-hand methods are quite as much a part of the Dunlop policy as meeting promptly or anticipating obligations contracted for or self-imposed, which has been a strict rule of the firm throughout its long career.

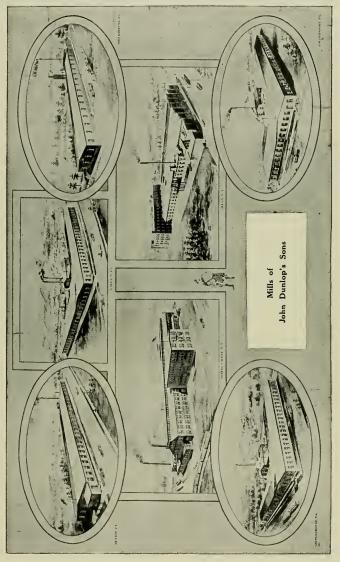
As regards the output of the Dunlop mills "good enough" is not sufficient to the Dunlop way of thinking, for no matter how great an improvement may have been accomplished in the product, the house is keenly watchful of opportunities to do just a little bit better; and with its high aims and purposes and eight mills in operation is in a commanding position to meet all demands of the trade.

The seven Dunlop mills, which are shown on the succeeding page, are located at Spring Valley, N. Y., Olean, N. Y., and Coudersport, Benton, Galeton, Shickshinny and Shinglehouse, all in Pennsylvania. The eighth mill is located at Buffalo. There are 1,250 operatives on the present payroll.

The Dunlop brothers are all residents of Rockland County, as was their father before them, and are prominently indentified with various local activities. George M. Dunlop was one of the founders of the Spring Valley First National Bank and with his brothers, John, Donald and Beveridge, has done a great deal to advance the interests of that town, whose first development was largely due to the establishment of the Dunlop mill, at that time the largest factory within many miles. Beveridge C. Dunlop

was one of the youngest members to serve in the New York State legislature. In the

subject of special official mention. George M. and John D. Dunlop are now residents



war with Germany he went overseas as a leader in Y. M. C. A. work and rendered such splendid service that it was made the

of South Nyack, but still maintain their interest of many years in Spring Valley affairs.

THE DARTMOUTH MANUFACTURING CORP. AND ITS PRESIDENT, WALTER HAMER LANGSHAW

There is a particular sense of gratification afforded in telling the story of a manufac-turer who has wielded an influence like that of Walter Hamer Langshaw, one of the most energetic and far-sighted executives in American textiles. His rise has been a demonstration of inherent power over circumstances. He knows the business of cotton goods manufacturing as only one can know it who has spent his life from early youth in unremitting attention to its every



WALTER H. LANGSHAW

detail. Add to this intimate conversance a keen, constructive mind and you may deduce the formula for his success.

Langshaw is a Lancasboro name, as records show as far back as the sixteenth century. The Eagley Mills, near Bolton, were founded in 1790 by a member of the family. Walter Hamer Langshaw was born in the town of Eaglev in 1859.

From the Eagley Mills of England to the mills of the Dartmouth Manufacturing Corporation in New England is almost as long a step forward in textiling as that from

the clipper ship to the trans-Atlantic dirigible in ocean transportation. Aside from

the huge resources employed, the plant at New Bedford, Massachusetts, is characterized by modern, progressive management that has been the subject of admiring comment and discussion. Textile men recognize the hand of Langshaw in the corporation's rapid accumulation of productive strength-some call it phenomenal growth, though it is no more of a phenomenon than any superlative achievement. right, however, in attributing results to Mr. Langshaw, the president and agent, and to the able support that he received from W. Seymour Langshaw, the assistant agent; Clifton W. Bartlett, the treasurer; and Hatton Langshaw, the general superintendent. The board of directors includes the additional names of W. Seymour Langshaw, Edward C. Langshaw, and Albert A. Jenks.

Walter H. Langshaw reached the presidency directly along the line of succession from more humble positions. His boyhood was devoid of educational advantages other than those he grasped between working hours in the mills, which he entered at the tender age of nine years after the family had come to America in 1866 and settled in Lawrence, Mass. A change of residence to Manchester, N. H., in 1872, and a return to Lawrence in 1874, was for the young textile worker merely a transfer of his labors from one mill to another and back again. Going to Rhode Island in 1877, he won sufficient attention to be given charge of a small department in a cotton mill, and another boost to the youth's fortunes put him in charge of a larger department in the Potomska Mills of New Bedford, in 1891. The ability there disclosed clinched his right to further consideration from the men higher up. The incorporation of the Dart-mouth Mills in 1895 was his opportunity. He was appointed superintendent and three years later he was elected a director.

Conflicting policies among those in control of the corporation brought on a crisis in 1900 from which Mr. Langshaw emerged as the leader of the industry. From that time to this he has held the reins and has so inspired the organization, raising it to the level of the highest industrial standards, that it is accounted a forceful example of enlightened practice in the new era of textile

manufacturing.

The Dartmouth mills cover a large area and form an imposing group of structures, as can be seen from the accompanying illustration. The main equipment consists of 200,000 ring and mule spindles and 5700 looms, making fine cotton and silk goods, plain, fancy and jacquard, which are sold direct, and exceptional facilities are applied to the making of novelties requiring special yarns of cotton or silk. Two thousand employees are engaged in the various departments. Solid financial strength underlies the business, which has an authorized capital of \$2,600,000. All in all the assets total over five million dollars.

Devotion to a single endeavor is an evident trait in Mr. Langshaw's character, so far as commerce is concerned. His connections outside the Dartmouth Manufacturing Corporation have been comparatively few. They number the presidency of the Bristol

quainted with the actual effects of tariff measures. While admitting that industries dependent upon skilled labor require protection for their development, he maintains that the issue of protection has been exaggerated and perverted to the demands of privileged interests. On the other hand, he believes that a moderate tariff is not oppressive when domestic production is equal to the market requirements and when avenues are left open to manufacturers of limited capital. He has, therefore, consistently advocated a moderate reduction in the tariff. asserting that such reduction would mean enhanced prosperity for the industrial and commercial enterprise of the country. In politics the author of these views is classed as an Independent Republican.



Dartmouth Manufacturing Corporation

Manufacturing Company of New Bedford, manufacturers of plain and fancy cotton and silk goods, and directorships in the Woonsocket Machine Press Company, the Massachusetts Trust Company, and the Massachusetts Employees Insurance Association.

Mr. Langshaw's fondness for the investigation of economic problems has led him into protracted studies, and they have been fruitful. A subject that he has treated with a skill born of experience and patient research is that perennial bone of political contention, the tariff. He embodied his opinions, original and compellingly expressed, in two brochures. One was used as a brief before the committee on ways and means of the United States House of Representatives in 1913. The cotton schedule was ably received and, in fact, taken altogether, Mr. Langshaw's writings are a well argued case for the conclusions he has reached. He argues not only as a student but as a business man and manufacturer acPossibly some will be surprised with the information that a man of Mr. Langshaw's business attributes is a musician. Music might be said to be his avocation, certainly something more than a hobby, for he gained a reputation as a pipe organist playing in New England churches. When still a boy he was the organist of St. John's Episcopal Church of Lawrence. Today he is one of the trustees of the New England Conservatory of Music at Boston. Mr. Langshaw is a Mason and a member of the Grecian Lodge of Lawrence. He is also known in many business and social clubs in New York and Boston.

Mr. Langshaw has been twice married, first to Miss Sarah Elizabeth Mahan, of Andover, Mass., in 1884, who died in 1896 leaving two children, Walter Seymour and Albert Colburn. He married Elizabeth Wilkinson, of New Bedford, Mass., in 1898. There are two children by the second marriage, Eunice and Rickard.

MIANUS MANUFACTURING CO.

The manufacturer who leaves the beaten track, eschews the overcrowded market, and introduces original products, not only leaves competition behind but earns the praise reserved for innovators as against even successful imitators. It is regrettable that the exigencies of merchandising must fasten the undeserved description of "imitation" upon



FRED A. SPRINGER

new creations quite worthy of being considered on their own merit.

The Mianus Manufacturing Company, officially classified as manufacturers of plushes and imitation fur fabrics, have made a secure niche for themselves in the mart of textiles. Inverting the usual order of chronological review in order that a conception may be given of the present size and individuality of this modest but serv-

iceable industry, the chronicle shall begin with the statement that since the organizing of the corporation the capital has been increased three times, first in May, 1917, from \$25,000 to \$200,000; again on May 1st, 1918, to \$250,000, on the issue of \$50,000 of preferred stock; and once again May 15, 1919, to \$300,000 on an additional issue of preferred stock. The officers are: M. D. Randall, vice-president and secretary; and F. A. Springer, treasurer and general manager. The office of president has been vacant since the death of Mr. Thomas I. Raymond, who passed away May 6th, 1920. Under the present regime the business has increased 150 per cent above its former level which, with an annual turnover of about \$1,500,000 and the value of good will developed, demonstrates a flattering state of efficiency.

Approximately thirty-four miles from the center of New York City, in Cos Cob of the town of Greenwich, Connecticut, is situated the extensive factory of the company, at an excellent strategic point for freight deliveries by rail and water. There they have a plentiful supply of pure water for dyeing and scouring purposes and abundant water power. The staple products-plush goods, carriage and automobile robes, imitation furs, and woolen goods -have been sold throughout the United States and Canada as rapidly as they could be manufactured. No artificial stimulus has been needed in normal times to encourage a demand which could no more than be

Competition was strong all along the way, but the keystone of the company's successful policy in surmounting obstacles has been the periodical production of new fabrics which have given them widely dispersed markets to cultivate and a range and variety of consumer support. Their specialties, imitation fur fabrics and novelty effects in overcoatings and cloakings, have kept them among the class of live manufacturers who do more than sit back on anciently won laurels.

A purchase which resulted in augmenting the company's manufacturing assets was arranged in April, 1914, when there was acquired from the receiver of the Derby

Fur Fabric Company, of Derby, Conn., machinery to the amount of six sets. These were immediately installed and operated in the factory property leased by the company from the owner, William F. Bishop, of Norwalk. This disposal of the machines was only temporary, however, being superseded by the plan matured during the years 1918 and 1919 and by which the properties at Cos Cob were enlarged, permitting the accommodation under one roof of the new machinery with that previously operated. The Cos Cob factory now has 150,000 square feet of floor space and sixteen sets of machinery.

The genesis of the Mianus Manufacturing Company was in 1897; its founder, Fred soon employed at the Sanford Mills, Sanford, Maine. Shortly thereafter he opened a designer's studio in Philadelphia, meeting with success in the undertaking, but inducements were held out which took him back to Sanford, where he continued profitably for a total period of ten years. During residence in Sanford he was for five years secretary of the Sanford Loan and Building Association, having been one of its organizers.

Since the founding of the Mianus Manufacturing Company, Mr. Springer has resided at Greenwich, Conn., and in the business and social life of the community he has concerned himself deeply. The Bureau of Business Affairs, the Republican town



Plant of the Mianuss Manufacturing Company

A. Springer, the present treasurer and general manager. The organization was brought about by his enterprise, and the first attending circumstance was the purchase at public auction of a mill comprising three sets, formerly the property of the Rippowam Woolen Manufacturing Company.

Mr. Springer is the son of William A. and Eliza A. Springer, and was born January 14th, 1866, at Marlboro, Mass. The earliest member of the family to reach America came from Stockholm, Sweden, and was one of the pioneer settlers of Wilmington, Delaware. The maternal branch was of English origin. Mr. Springer's profession was decided at the Lowell School of Practical Design of the Massachusetts Institute of Technology of Boston, from which he graduated fully equipped with the technique of the designer, and as such he was

committee, and the town school committee. of Greenwich, have had his active cooperation. He was also chairman of the school board of Greenwich for several years, and was on the local Council of Defense during the war. He has served as Justice of the Peace of Greenwich, is a director of the Greenwich Trust Company, and is a member of the Board of Directors of the Bruce Museum of Greenwich. He is a member of the board of managers of the American Protective Tariff Association of New York and holds membership in the Fairfield County Association of Engineers. Lastly, Mr. Springer's interest in religious and fraternal matters is marked. He is an Elder of the First Presbyterian Church of Stamford, Conn., and belongs to the Acacia, Lodge No 85 A. F. and A. M., of Greenwich, and Ponus Lodge, A.O.U.W. of Stamford.

HAMILTON WOOLEN CO.

Subject to various vicissitudes, particularly in the early part of its history, the Hamilton Woolen Company of Southbridge, Mass., has, nevertheless, been one of the most successful and ably managed concerns of its kind in the country. Established in 1829, it is more than ninety years of age. The mill stands on the same site which was occupied first by the Globe Manufacturing Co., and later by the Wolcott Woolen Mfg. Co. latter's plant was considerably damaged by a freshet in the Quinebaug River in the spring of 1828. Soon afterwards Willard Sayles and Samuel A. Hitchcock, of Boston, purchased the property. The company was incorporated January 17, 1831, with a capitalization of \$200,000, and organized June 29 of the same year with Samuel A. Hitchcock as president; Willard Sayles, clerk; and Samuel A. Hitchcock, Willard Sayles and Lorin Norcross, directors.

Mr. Hitchcock became general manager and resident agent. The equipment then included five sets, with dyeing and finishing machinery for the manufacture of broad cloth. Twenty-eight broad looms were in operation. The first year in which the mill was run under the new management. 40,7781/2 yards of cloth were manufactured, the value ranging from two to five dollars a yard. Mr. Hitchcock continued agent until 1836, retiring that year and disposing of much of his stock to Charles Merriam. Samuel L. Fiske succeeded Mr. Merriam. The wool manufacture during Mr. Hitchcock's treasurership was very successful, requiring a considerable enlargement of the plant. In 1837 a six-story brick mill was completed. In 1838 the machinery was installed, making the equipment ten sets, with sixty broad looms. Manufacture of delaines was introduced for the first time at this plant in 1844. In order to make cotton warps used in connection with the manufacture of the delaines, a small cotton mill was erected near the dam.

In 1845 the capitalization was increased to \$500,000, the officers then being Charles Merriam, clerk; Addison Gilmore, treasurer; and Oliver Dean, Josiah Stickney, William J.

Walker, Willard Sayles and Gardner Brewer, directors. The capitalization was increased in 1846 to \$1,000,000, and in 1920 to \$2,500,000, the present figure. Mr. Gilmore resigned as treasurer and John Gardner succeeded him April 14, 1846. In 1847 the mill of brick and wood which had been erected by the Wolcott Woolen Company was repaired and the delaines were printed there. In 1840 another brick mill was built, as more cotton warps were needed.

In 1850 the six-story mill was burned down, with a loss estimated at \$180,000. The company met the loss, however, and the mills were rebuilt in 1851 on the same site with an addition of a two story wing. At that time the manufacture of fancy cassimeres was also carried on instead of the broad cloth. The delaines produced at this plant attained a high reputation and were unsurpassed in quality in any country. As late as 1860 the manufacture of worsted goods was practically confined to three mills, including the Hamilton Woolen Company. It was not until a few years before this that wool combing machinery was perfected.

1860 a brick mill was erected and equipped with machinery for manufacturing print

cloths, but owing to the beginning of the Civil War, the business was put off tempor-

arily. In 1861 the dam was further strengthened, and the print works were also much

enlarged and improved. In 1864 the brick mill was equipped with delaine ma-

chinery, including 288 looms.

Until about five years ago the Hamilton Woolen Company also operated a mill at Amesbury, Mass., producing print cloth and cotton sheetings. This was sold in 1915. In 1917 the Hamilton disposed of its cotton carding and spinning machinery at Southbridge, and has since purchased outside whatever cotton yarn it uses in its fancy dress goods. After selling out its cotton department the company thoroughly reconstructed its organization, consolidating and co-ordinating its departments, and bringing about a more efficient production. The old cotton spinning mill was converted into another wersted establishment, and a new

building erected adjoining it Considerable money was expended for this purpose so that the plant is in the best possible condition to give stockholders a chance to realize as much as possible on their property.

The present treasurer, Arthur E. Mason, recognized as a particularly able executive,

a prominent position in the market. They are profitably sold through Wellington, Sears & Co. The equipment is 30,000 spindles and 1,000 looms. Thirteen hundred hands are employed. Stock of the mill is highly valued and in many cases has been handed down from one generation to another.



Mills of the Hamilton Woclen Company

when mailing an announcement of a meeting to stockholders in August, 1920, enclosed with the letter a sample of the fancy serge dress goods, so that if any shareholders did not happen to know just what kind of cloth the mill manufactured they then had an opportunity to learn.

Besides the standard serges the product of the company includes poplins, alpacas, and novelties. A few cotton worsteds are also made. For many years its serges have held The company has been particularly fortunate in having skilled men at the head of the business. The present officers of the company are as follows: President, Thomas P. Beal; treasurer, Arthur E. Mason; mill agent, E. Benjamin Armstrong; clerk, John M. Foley; superintendent, Arthur C. Varnum; purchasing agent, G. S Rich; directors, Thomas P. Beal, Arthur E. Mason, Isaac W. Chick, Bernard F. Merriam, John E. Thayer, Jr., and William H. Wellington.

CHARLES H. FISH

Charles H. Fish, consulting engineer, with offices at 73 Tremont street, Boston, Mass., was for many years connected with the cotton manufacturing industry, and began his active manufacturing career at the Amoskeag Manufacturing Company, Manchester, N. H., working for nearly three years in the shops and then through the various departments of this great corporation,

throughout the country, and also a large department for the manufacture of velveteens, which Mr Fish established.

He retired from this position to become general manager of B. B. & R. Knight, Providence, R. I., and later for two and onehalf years of the Garner Print Works & Bleachery, with works at Garnerville and Wappingers Falls, N. Y.



CHARLES H. FISH

until finally he was appointed assistant cuperintendent and held this position until appointed agent of the Chicopee Manufacturing Company at Chicopee Falls, Mass. He was in this position for two years and then accepted the position of agent of the Cocheco Manufacturing Company at Dover, N. H., where he remained for a period of thirteen years. During this period the Cocheco Manufacturing Company had, aside from its cotton mills, a large print works, the Cocheco Print Works known

Mr. Fish is a member of the American Society of Mechanical Engineers; a life member of the National Association of Cotton Manufacturers; the Union Club of Boston; The Engineers' Club, New York City; and others. He is an ex-president of the National Association of Cotton Manufacturers, and also an ex-president of the New England Textile Club.

His father, Captain Frederick L. Fish, all his life commanded a whaling ship sailing from New Bedford, Massachusetts.

THE ESMOND MILLS

The Esmond Mills are located in Esmond, Rhode Island, about seven miles from Providence. The products of The Esmond Mills are Jacquard cotton blankets, bath robes and napped fabrics. These are woven into Whitman, treasurer; Dexter Stevens, manager; and John A. Pearson, secretary.

The above with C. R. Clapp and F. Gilbert Hinsdale constitute the board of directors.



Esmond Mills, Esmond, Rhode Island

the beautiful designs which have become so popular in our American stores. They are very durable and are easily washed.

The officers of The Esmond Mills are as follows: Clarence Whitman, president; Henry P. Binney, vice-president; Harold C.

Messrs. Clarence Whitman & Son, Inc., are the selling agents of the Mills, both here and in foreign markets. Their main office is in New York with branch offices located in Chicago, St. Louis and San Francisco.

CHENEY BROTHERS

What the silk industry of America owes to the family of Cheney, present and past, is almost beyond computation. The preeminence of Cheney Brothers as manufacturers and distributors of silks is rooted in very nearly the earliest traditions of silk fabrication on this continent. From them has proceeded the strongest incentive to the creation of a silk industry; they have set standards that have kept the industry on high levels and have nurtured the conception and execution of numerous of the most important mechanical improvements. They are one of the world's greatest producers of silks and they are the only manufacturers to take the raw silk and carry it through the complete succession of processes to the finished goods.

Cheney Brothers' mills at South Manchester, Connecticut, are impressive from many points of view. The visitor first sees a spreading group of buildings which it would be a misnomer to call factories, for they fulfill none of one's preconceived images of the ordinary blackened pile of brick surrounded by grimy dwellings. The Cheney Mills are a decidedly pleasant prospect seen in the midst of a great expanse of rolling country, green lawns, and shade

trees.

Some nine structures comprise the collection, as can be seen from an accompanying illustration: The spun silk mills; the throwing, upholstery, and dress goods weaving mills; the spun silk dressing mill; the velvet mills; the yarn dye house; the ribbon mills; the velvet weave shed; the store house and machine shop; a total area

of thirty-six acres of floor space.

Of the 4500 employees, some have been with the firm over fifty years, more have served a quarter of a century, and over half have had upwards of five years experience in the Cheney Mills. Figures indicative of the values represented are the \$7,000,000 capitalization and \$4,000,000 worth of raw stock required for a year's operation.

During the first years of the nineteenth century the United States was stirred by a boom in silk-raising in consequence of the introduction of the morus multicaulis tree,

a species of Chinese mulberry which, owing to its rapidity of growth and abundant foliage, promised rich returns. Nurserymen were beseiged with orders for the young plants and the demand soon exceeded the supply. A date important in the history of the Cheneys is 1838 when the brothers established their first nursery at South Manchester, Conn. They were heavy purchasers of the morus multicaulis, laid out many hundreds of trees, built additional nurseries and cocooneries at Burlington, N. J., and Cincinnati, Ohio, and sold the plants in quantities of thousands.

The frenzied finance of the silk boom ended in a crash. Plants that had sold for \$4 a hundred in 1834 were selling as high as \$300 per hundred in 1839. Simultaneously it was realized that the morus multicaulis did not thrive in the North, and neither had Americans the patience to give the silk worms the care necessary to their

culture.

After the debacle more thought was given to manufacturing., The first American silk mill was that of Rodney and Horatio Hanks, opened at Mansfield, Conn., in 1810. It was 12 x 12 feet in size, intended for making sewing silk and used water power, but with two other small mills jointly established it was abandoned in 1828.

Successful silk manufacturing began with the Cheney Brothers. Ralph, Ward and Frank Cheney, with E. H. Arnold, formed a company in November 1837. The actual consummation was effected in January 1838, the capital stock being put at \$50,-000. The original mill was the Mt. Nebo Silk Mills, of South Manchester, Conn. The Cheney Brothers fostered a succession of far-reaching mechanical, improvements. First was the Rixford roller, and in 1847 Frank Cheney patented the only practical machine then in existence for making sewing silk, to the manufacture of which the Company was devoting its chief energies.

The Cheneys created an entirely new branch of the silk industry when they devised a method of spinning the hitherto waste silb, the tangled and broken filaments which could not be reeled. The manufacture of machine twist sewing silk also developed into an important department. The invention of a spooling machine by Frank Cheney and Grant in the fifties enabled one operator to attend to three machines instead of one as previously.

Growth of business led to the construction of new mills. One was erected at South Manchester, and others, for the making of ribbon, were established in Hartford. In 1854, the firm became the Monners of the Cheney Mills. An invention of supreme consequence to the silk industry, and incidentally to cotton and wool makers, emanated from the Cheney Mills in 1882. It was the Grant reel, named for its inventor who had been employed in the mills from 1840, and it simplified the winding of the skein onto the reel while protecting the thread against snarling.

Later developments of the Cheney business have been numerous. The mills have increased in number and every up-to-date



Plant of Cheney Brothers, South Manchester, Connecticut

Cheney Brothers Silk Manufacturing Company, and the capital stock was increased in 1855 to \$400,000. The weaving of ribbons and of grosgrains were important additions to the firm's production during the sixties. Separate spinning mills were added in 1872. A final change of name occured in the following year, the former lengthy title being reduced to simply Cheney Brothers. Soon, in 1880, they made another forward step, taking up the weaving of plush and velvet on two looms imported from Germany, which were later replaced by the loom, now used in great numbers, invented in 1892 by Richard

machine and process has been adopted for the sake of efficiency.

The products need no praise, though the infinite beauty and variety of textures and designs merit extended description. They are a standard of excellence wherever silk is traded.

The men at the head of this great firm are: Frank Cheney, Jr., president; Robert Cheney, vice-president; and Charles Cheney, secretary and treasurer. The board of directors includes, Frank Cheney, Jr., Charles Cheney, Robert Cheney, Clifford D. Cheney, Herace B. Cheney, William C. Cheney, and Philip Cheney.

J. R. MONTGOMERY CO.

The firm of J. R. Montgomery & Company, of Windsor Locks, Conn., was established in 1871 for the purpose of manufac turing the cotton warps used in satinets and union cassimizes. The firm was then composed of Mr. J. R. Montgomery as the active partner, with two associates who constituted the partnership.

goods. The firm thus stands as the pioneer in this branch of textile industry in America. A separate plant of large proportions, and showing an evenly balanced system of production that affords exceptional manufacturing facilities, has put out these yarns in yearly increasing quentities. Their manufacture is begun at



Plant of J. R. Montgomery Co., Windsor Locks, Connecticut

A few years later, the other interests were bought by Mr. Montgomery, who continued under the old name until 1885, at which time Mr. George M. Montgomery was taken into the business as an active partner, and the line of products was enlarged by taking up the manufacture of novelty yarns, then a new and unique line of goods. They have become very popular, and are used for a great variety of purposes in the manufacture of dress

it- 'oundation, not only in the treatment and manipulation of the stock, but also in the construction of the machinery, all the special machines being made in the shops of the Company.

In 1891, J. R. Montgomery & Company was merged into a corporation under the name of J. R. Montgomery Company, of which J. R. and George M. Montgomery were made active managers. A new cottrn warp mill and an addition to the

novelty yarn mill were built. The capital of \$350,000 was invested in enlarging the scope of the business.

One of the first enterprises undertaken under the new regime, and an innovation in its time, was the placing upon the market in 1896 of mercerized cotton yarn. While mercerizing was not, strictly speaking, a new thing, the process having been discovered many years ago by an English dyer, the use of this process to produce a high silk-like lustre was an entirely new discovery. The J. R. Montgomery Company were the first to recognize its value.

yarn mills are of extraordinary diversity, exhibiting a wealth of contrasting materials and permitting the attainment of novel dress effects. Yarns of innumerable kinds of fibre of gold, silver and copper tinsel, chemicals, compounds, glass, etc., made up in knotted, loop, flake, bunch, spiral and speck yarns, also as brilliants, boucle, metal cords, and electric thread—in whatever forms, in short, the trade desires.

The J. R. Montgomery Company was first in the United States to make tinsels, and it is the only concern of any import-



J. R. Montgomery Co., Windsor Locks, Conn.

It has within a few years become widely known and extensively used.

The Company possesses facilities for producing large quantities of cotton warp in both plain and fancy colors, as well as double and twist yarns in carded and combed Egyptian, Sea Island and peeler stocks which show many colors and printed effects. They gas and mercerize all of the above yarns in all sizes, and deliver them to their customers in skeins, on cones or tubes, jack spools, chain or ball warps, or loom beams, plain, or in patterns. They manufacture upholstery tinsels, and tinsels used in dress trimmings and for decorative purposes. The products of their novelty

ance in America now engaged in that line of manufacture. Every possible means has been employed toward improvement of method and perfection of result. A large part of the machinery used in the mills had to be especially adapted to its purposes, such adaptation calling for quite as much mechanical ingenuity and inventive skill as the designing of an entirely new machine. A mechanical laboratory is maintained where every phase of the process of manufacture is constantly studied, and numerous experiments are made with the object of increasing the efficiency of the plant, both as to quantity and quality of the product.

D. GEORGE DERY

A LEADING SILK MANUFACTURER

A little more than a quarter of a century ago D. George Dery, a college graduate, and developed in the best weaving schools of the eastern world, began his business career in the United States. He had ac-quired a thorough knowledge of silk weaving and all the attendant details of silk manufacture in Europe, and with this as his chief capital at the beginning he has risen to a height in the silk manufacturing world that he at first little dreamed of. His career furnishes another and one of the most striking illustrations of the success that can be obtained by a right-minded, clean-living, ambitious young man, with a definite view in life. Beginning as a superintendent, Mr. Dery in a few years became a manufacturer, acquiring mill after mill in different localities, until today he is the largest individual silk manufacturer in the entire world. This result has not been attained by any lucky turn of fortune's wheel, but by a thorough knowledge of his business, untiring energy, and a sagacity that has never led him astray in the choice of a field of activity. With more than twenty-five mills in operation in Pennsylvania and Massachusetts his immense capacity for work can be estimated in some degree, but not fully understood until one realizes the responsibility this imposes on one man, the directing head of all. For this is not a corporation business, as Mr. Dery not only owns but directs the many silk mills that bear his name.

The demands of his business would seem to be sufficient to fully occupy his every moment, but so well has he systematized his business and so well as he surrounded himself with men of capacity that he has had time to cultivate the finer side of his

nature and surround himself with the choicest in art and literature. His library of standard authors of the old and new world is one of the greatest pleasures of his life, while his private art gallery is filled with the best from the old and modern masters. His knowledge of books, art, and artists, is profound, and his art collection, the finest in the Lehigh Valley, is a source of deep enjoyment to the owner.

After acquiring an education Mr. Dery

began his life-long connection with silk manufacture. He gained a wide knowledge of all the details connected therewith and before coming to the United States was in charge of important plants. ward the end of the eighties he came to the United States, locating in the principal silk manufacturing city of this country Paterson, New Jersey. There he became superintendent of one of the mills, continuing as such for five years, then in 1892 started a silk mill in Paterson. This mill he conducted until 1898, when he built plant in Catasauqua, Pennsylvania, later making that place his home and the base of his subsequent operations. The original plant at Catasauqua, which he built in 1897, was equipped with the latest type of silk weaving machinery and was devoted to the manufacture of broad and staple silks. Its capacity was doubled in 1899, and it fully occupied Mr. Dery's energy until 1900, when he established his second plant on a more extensive scale, locating at East Muach Chunk, Pennsyl-His reputation as a manufacturer

was now established in the silk trade and the demand for goods bearing his name

outran the supply. He met this demand

by the erection of a third plant in 1902, choosing Allentown, Pennsylvania, as a location. From that time until the present the expansion has been constant. Mr. Dery now has a chain of twenty-six silk mills, all in Pennsylvania, except one in Taunton, Mass., and one in West New York, N. J. His fourth plant was located at Emaus, Pennsylvania, following by mills B. C. D. and M at Allentown. He next erected a mill at Taunton, Massachusetts, followed in rapid succession by mills in Pennsylvania, at Kutztown, Northampton, Wind-Gap, South Bethlehem, Scranton, Olyphant, Forest City, Marietta, Mill-B at South Bethlehem, Lancaster, Maltby, Green-Lane, Souderton, York A, York B, Kingston, and West New York.

As an employer of labor M. Dery is extremely practical, holding the view that upon the prosperity of his workers depends the success of his business ventures. To this end he contributes by fair treatment and good wages, the best mechanical equipment, and a due regard for the welfare of all concerned. Short time is unknown in his mills and full wages are the rule even in times when business con-ditions would justify closing down or shortening hours. He is an idealist, but takes the broad sensible business man's view that contented workmen are the best workmen. To the wealth and prosperity of the Lehigh Valley and other sections of Pennsylvania his operations have materially added, while the money distributed weekly to his employees is enormous in its volume. Mr. Dery maintains general offices in the National Bank Building, Allentown, and New York offices at 383 Fourth avenue.

Cultured and refined in his tastes, social and agreeable in his nature, Mr. Dery's greatest enjoyment and recreation is in his books and study. Chemistry and physics especially appeal to him and to these he devotes much time and research. Several

of his works have been printed and are on the bookshelves of the reading public. He is broad-minded and generous, aiding in the establishment and maintenance of institutions, charitable, philanthropic, and humanitarian. He enjoys the society of his fellow-men and belongs to social organizations in different cities-the Lehigh Country Club, the Northampton, Bethlehem, Livingston and Catasaugua, and York clubs in Pennsylvania; the Hamilton Club of Paterson, New Jersey; the Manufacturers' Club of Philadelphia; and the Manhattan, Republican, and Aldine clubs of New York City. He is a well known and influential member of the National Assocciation of Manufacturers of the United States, the Metropolitan Museum of Art, Zoological Society of New York, Society for the Advancement of Science, and of other societies, scientific and educational.

He married at an early age, and with his wife, Helen, and family, has since 1898 maintained his residence in Catasauqua, Pennsylvania. His children, are: George M. Dery, a graduate of LaFayette College and Harvard Law School; Charles F.

Dery; and Helen Dery.

A remarkable man from whatever angle considered, Mr. Dery can review his career from the topmost round of commercial success. As the largest individual silk manufacturer in the world he occupies that position through his own efforts, has wronged no man, and can claim success as fairly earned. Neither has he wronged himself by pursuing the golden goddess at the expense of those qualities of mind and heart that constitute man's finer nature. His fortune, fairly earned, is used not ostentatiously but for the enrichment of his mind, the adornment of his home with all that is best and most elevating, for the advancement of those who rely upon him for employment, and in charity. He is, in addition to all, a good citizen, a kind friend, and loyal to every obligation.

HENRY DOHERTY SILK CO

Long experience, location and good business connections have served to raise the Henry Doherty Silk Company to its present eminence in the textile industry of America. Founded by Henry Doherty, who was born in Macclesfield, England, February 6, 1850, the business prospered from its beginning in 1901, and now owned and conducted by Mr. Doherty's sons has reached a point where its annual net sales approximate \$5,000,000.

Henry Doherty, the founder, was one of the silk pioneers who put the industry on its feet in this country and locating in Paterson, New Jersey, helped to make Paterson famous as "The Silk City." In 1879, Mr. Doherty entered into partnership with Mr. Joseph Wadsworth, and later their business was incorporated as the Doherty & Wadsworth Company. In 1901, Mr. Doherty also established in their Hall Mill in Paterson an individual plant to make a specialty of weaving plain silk goods. It was the first plant to produce this kind of fabric on a large scale in Paterson.

On December 9, 1908, the latter business was incorporated as the Henry Doherty Silk Company and moved to its present mill of a thousand looms at Clifton, New

Jersey, near Paterson.

The founder of the firm died while on a visit to California, February 1, 1915, and his employees erected a bronze tablet to his memory as a testimonial of their high esteem. After Mr. Doherty's death, and in accordance with his wishes, the Henry Doherty Benefit Fund was incorporated. The Fund gives to every one of the 1,000 employees of the Doherty mill protection not only in case of death but also in case of sickness and accident, and old age as

One of the outstanding characteristics of the Henry Doherty Silk Company is the consideration accorded to the employees. The first Henry Doherty was most punctilious in this regard, and his sons are too. The firm is now composed of Henry Doherty, Jr., president; Raymond Doherty, vice-president; and William H. Doherty, They are all forward going treasurer. American business men who enjoy a very high reputation in their particular line and command the respect of their large force of workers. On the same great tract of land on which stands the Doherty mill is the famous Doherty oval, home of the Silk Sox baseball team, the Henry Doherty Silk Company's champion industrial baseball organization. This happy departure and the interest the Doherty brothers take in it has been a strong factor in cementing the friendly feeling one toward the other which exists between employer and employed.

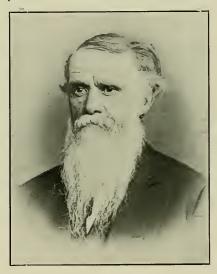
THE EDDYSTONE MANUFACTURING CO.

If an exclusive history of the textile industries of Philadelphia were being written much would be told of the establishment and growth of The Eddystone Manufacturing Company. The well-equipped plant situated on the Delaware River at Eddystone, Pa., near Philadelphia, is testimony to the valuable industry here represented, and other evidence is the opinion spoken of it throughout American textile markets and in foreign fields. The number of processes carried on show the diversity of operations, viz.: the converters finishing service, including engraving, bleaching, mercerizing, dyeing, printing, napping, and finishing; the fabrics produced, flags, draperies, prints, and wash goods, including lynnenes, cretonnes, repps, mulls, poplins, and organdies—all these are the tangible basis for the trade's knowledge of the standards of quality and reliability inherent in the firm.

Some 500 people are employed, the majority Americans, and the equipment is of most modern construction. Further, the Eddystone Print Works has advantageous shipping facilities, being situated on direct rail and water routes. The executive offices are located at 1012 Pennsylvania Bldg., Phila., Pa., and a sales office conducted at Burton Bldg., 267 Fifth avenue, New York

To trace the origin and development of the business out of which grew The Eddystone Manufacturing Company, disregard the date of founding, 1842, in favor of the birthday of William Simpson, April 21, 1812. The Scotch parents of the future manufacturer of Philadelphia brought him from Manchester, England, to the former city, in 1818. There he was educated, and in 1836 started printing handkerchiefs at the Falls of Schuylkill. He began calico and silk printing in 1842 making what afterwards

became the celebrated "Simpson Prints", and in 1869, admitting his sons to the business, established the firm of William Simpson & Sons. The old print works stood on ground eventually condemned for park purposes which circumstance caused removal



W. P. SIMPSON

to Eddystone, the erection there of a new plant, and the formation in 1877 of The Eddystone Manufacturing Co., Limited.

The Company became a corporation in 1895 and has now a capital of \$1,000,000. W. P. Simpson is president and treasurer; Dr. A. L. Bossi, vice-president and general manager; and Wm. Simpson, 3rd, secretary.

FRANK F. PELS CO., INC.

"Keeping everlastingly at it results in success" has been the slogan of the Frank F. Pels Company, Inc., since its inception twenty years ago, and strict adherence to this truism has in this case yielded no small measure in gratifying results. Starting in 1900 at New Durham, New Jersey, the present management erected a factory, and the plant has been steadily growing year by year until now a good-sized tract of an acre or more is covered with its buildings.

handle all orders with dispatch. All grades and numbers of cotton yarns, from coarse to fine counts, are sold by the Company, in skeins, warps, tubes, cones and bobbins. The mercerization equipment is unsurpassed, and the dyeing department ranks among the very best.

Under the heading of real Japan silk the Company throws organzine, hosiery tram and novelty twists, catering to the most particular trade throughout the country. Recently additional machinery was installed to



There came further expansion when in August, 1919, the company acquired the Ellroyd-Lynch throwing plant at Beacon, New York, where organzine and tram are produced exclusively. The Company also acquired more than 15,000 square feet of space at 627 West Forty-third street, New York City, for factory purposes.

These three centers of manufacture, conducted as they are on the highest plane of efficiency, enable the Frank F. Pels Company, Inc., to successfully compete with all comers in price, quality and service. It is at these three centers that yarns are received in the raw state and processed in any manner that the trade may desire. The latest and best machinery is installed to

place the Pels Company among the largest producers of these products.

Artificial silk is also thrown by the Company in every imaginable twist desired by the trade, put up in skeins, tubes or cones, natural or in colors.

The Frank F. Pels Company, Inc., enjoys an enviable position in the textile industry because of its complete organization, enabling the direct supervision and production of practically the entire finished product in the manner specified. The New York headquarters is at 17 East Twenty-fourth street, occupying three floors, and from here the Company's executive organization, complete in all its details, directs factory as well as administrative and selling operations.

EVERETT, HEANEY & CO., INC.

Though the world at war afforded abnormal opportunities for extension of our foreign commerce, credit for the progress made is chiefly due to our own manufacturers and their representatives who could "make good" on the merchandise. It has been the experience of Everett, Heaney & Company, Inc., that once they were successful in introducing an article abroad, the trade upon it could not only be held but increased from year to year. They have now, in fact, a very large volume of foreign business, and are among the prominent exporters of dry goods

Geographically, their trade territory spans the globe. Besides operating in all the South and Central American republics, they have established in China, the Philippines, Java, Straits Settlements, India, Africa, Australia, in Norway, Sweden, Denmark, Italy, Spain, Cuba, Demerara, B. G.; Trinidad, Mexico, Republic Dominica, Colombia, Republic Panama, Brazil, Argentine Republic, Chile, Curacao, Dutch West Indies; Canary Islands, and Haiti. Many of the Company's foreign offices are maintained by representatives sent from headquarters in New York, while others are in charge of local residents.

The business of Everett, Heaney & Company, Inc., was founded in April, 1893, as a partnership between Frank J. Heaney and Silas K. Everett. The original capital was \$25,000, the employees few in number; but an uninterrupted growth set in which has carried them forward abreast of the times. A contributory cause may be that throughout its history the firm has been under one management. Richard J. Meehan became a third partner in the early period.

The next pronounced change within the firm was its incorporation in April 1917 with a capital of \$2,000,000, a surplus of \$267,-

000 having since been added. More than 200 employees are on the pay roll. Abroad, the resident managers and traveling salesmen augment the force. The export business of the Company is linked with a domestic or home trade department, which is an indispensable adjunct to the successful exportation of cotton piece goods, enabling the execution of orders in a large assortment of colors and styles required by foreign markets. The converting department is an important branch of the Company's organization in this country, manufacturing various classes of cotton and cotton and silk piece goods for foreign markets. Further, the Company maintains a flourishing import department, which has successfully introduced many lines of foreign goods to American buyers. A general merchandise department was organized some few years ago and has developed constantly since. The Company represents a great many maufacturers in the export field.

Another interesting feature of the Everett, Heaney Company's growth is their underwear department. The Philippine embroidery is made by the Company itself at Manila, where a very large plant is owned by them. The largest and best stores throughout the country are using these embroidered undergarments, and are very well pleased with them.

The officers of the Corporation are: Silas K. Everett, chairman of the board; Frank J. Heaney, president; R. J. Meehan, vice-president; and S. K. Everett, Jr., vice-president.

The headquarters are at 498-504 Broadway, New York City. The Company fulfills the description, "An American company for foreign trade under the supervision of practical men."

SAMUEL EISEMAN & CO., INC.

Up to 1881 it could not be said that the scientific distribution of silk amounted to much, but in that year the firm of Eiseman Bros. took hold of the problem, establishing themselves at 73 Grand street, New

dented in their particular line. This growth was continuous, year by year, until finally t became necessary to occupy ten buildings. These were situated at Grand and Woster streets.



Department Heads of Samuel Eiseman & Co., Inc.

York, in an office not more than 20x25 feet. That their enterprise met a long felt need was evident from the fact that success came to them at once. Their business grew by

With the uptown movement of the silk andustry the great distributing concern moved in 1913 to the present spacious quarters in East Twenty-third street, which



Mills of Newmarket Manufacturing Company

leaps and bounds, each year being an improvement on the year before.

In 1898 the firm of Eiseman Bros. became Samuel Eiseman & Co., and under this name flourished to an extent unprece-

occupy an area of more than 70,000 square feet. In 1917 the Company was incorporated.

At the present time with a staff of 250 associates and salesmen that cover the en-



Officers and Directors of Samuel Eiseman & Co., Inc.

tire civilized world, the distribution of silks by Samuel Eiseman & Co., Inc., is enormous. They carry the largest stocks of silks in the United States and operate thousands of looms. They are justly proud of their reputation of being the largest converters of silk and silk and cotton goods in America. They have also become the selling agents of large mills such as the Newmarket Manufacturing Company and the distrib. utors of the silk and cotton product of the Pierce Manufacturing Corporation and of the fabrics produced by Julius Kayser & Co.

It is a fact that many buyers throughout the country regard Samuel Eiseman & Co. as their wholesale branch and source of supply, and many small establishments come to them because they can always depend upon obtaining a complete variety of goods collected under one roof and displayed in "Avenues of Silk".

This thriving concern has also specialized in silk shirtings, neckwear silks and special articles made for and distributed to the cutting-up trades. The success of Samuel Eiseman & Co., Inc., is attributed largely to the fact that they are silk specialists and therefore can be counted upon to give the closest attention to the wants of their most exacting customers.

Known in the trade as "The Silk Clearing House of America", the men who have been directing the affairs of the Company



Omce of Samuel Eiseman & Co., Inc.

have brought their methods to the highest point of efficiency since the pioneers of silk distribution first put their ideas into practice thirty-nine years ago.

THE ROCKFALL WOOLEN CO.

Horse blankets and camp blankets have been coming from the mill of the Rockfall



Plant of the Rockfall Woolen Co.

Woolen Company since 1882 in ever increasing quantities but always the same All manufacturers who put their quality.

names on the best merchandise that materials, machines, and labor can produce, as do the Rockfall Woolen people, deserve a blue ribbon whether they make ermine

robes or equine apparel.

Bernard F. Merriam, Joseph Merriam, and Robert W. Merriam are now president, treasurer and secretary, respectively. Their progress has been unspectacular; they have, as they say themselves, simply had a fortunately chronic case of "stick-to-it-iveness". Their blankets are liberally dealt in everywhere east of the Rocky Mountains and the growing demand has lately brought their production figures up to 150,000 blankets or 1,000,000 pounds of material per

Their plant comprises ten sets of cards, 2000 spindles and sixty broad looms. They

employ about 130 workers.

The Allen Lane Company, of Boston and New York, are and have been selling agents for their goods since the organization of the Company.

LOCKWOOD, GREENE & CO.

AND THEIR CONTRIBUTION TO THE TEXTILE INDUSTRY

During the ninety years of existence, Lockwood, Greene & Co. have taken a leading position in the development of the textile industry. The company early organized the advantages of water power and was the pioneer in building mills directly connected with it. Later, with the development of the Corliss engine making more effective steam plants, engine-driven mills with rope drive were built.

The alternating current motor was being developed and perfected, while mechanical power yet held sway. Lockwood, Greene & Co. adapted this motive power to textile use, and in 1892, at Columbia, S. C., designed the first cotton mill to be driven electrically from a water power. Eighteen of the G. E. induction motors applied in this mill in group drive are still in operation after twenty-six years of service. The Pelzer Mills built a year later formed the first complete hydro-electric installation including a dam, water power, mill, The advantages of electric drives in the textile mills were manifold, and today there are but few mills which have not adopted this form of drive. All sections of the territory in which Lockwood, Greene & Co. was called upon to assist did not have water power available. This situation was met in the design of the mill driven electrically from a steam plant, the first of its kind being built for the Lancaster Mills, at Clinton, Mass.

The original textile mills were built of wood and brick, of beam and joist construction. But this type of design formed a dangerous fire trap and gave way to the slow burning type. Amos D. Lockwood, whose name is borne by the present company, built a mill of this latter construction as early as 1852, one of the first of the kind ever erected. This type continued to be much used, and even today is desirable for certain small units. Mr. Lockwood also developed during this period what became known as the "Lockwood framing." This type came into popular use in that it increased the unobstructed floor area by reducing the number of columns. The present method of

framing floor steel is adapted largely from the same principle.

Concrete was being developed rapidly, however, and in 1909, the Maverick Mills, in East Boston, were designed and built of reinforced concrete, being among the first large cotton mills constructed entirely of this material. Four classes of concrete construction have been adapted to textile mill design by Lockwood, Greene & Co.-the beam and girder, of which the Naumkeag Steam Cotton Co. at Salem, Mass., is the largest of its kind; the tile and joist, which is less frequently used; the flat slab type, well typified in the International Cotton Mills plant at Lowell, Mass.; and the sawtooth type of roof construction which, although not original with Lockwood, Greene & Co., has been improved upon by them, and is used very advantageously in weave sheds.

Although giving aid in the development of the best types of mill buildings, Lockwood, Greene & Co. continued the work within the mill itself. This experience assisted greatly in the economic placing of the various machines. Great progress has been made also in the producing of superior natural lighting conditions, as well as artificial illumination. The use of the enameled steel reflector in direct lighting, has been a distinct aid to production and has helped to improve the conditions under which the operative works. The conveyor system has been adopted in the more recent plants. A system has been placed in the Jackson Mills of the Nashua Mfg. Co., where the materials are routed from the top floor to the bottom, which revolutionizes the former theory of routing material in the process of manufacture.

So intimately have Lockwood, Greene & Co. been associated with industry at large that the firm has gained a wealth of experience which it has been able to apply to textiles in particular. And so, today, while the company engages in a general engineering and architectural business, it continues to maintain and develop associations in the textile field where, from the beginning, it has been especially active.

SUNCOOK MILLS

One of the most successful of the New Hampshire textile plants is the Suncook Mills. The present company, which was organized in 1907 and made a Massachusetts corporation in 1910, was a consolidation of the Pembroke Mills, the China Manufacturing Co., and the Webster Mills of Suncook, N. H. Located on the Suncook River just before it merges its waters with those of the Merrimac, this group of mills stands on a site where one or more cotton mills have been for nearly a century. For more than fifty years the different concerns have been under control of the same families. In 1857, the Pembroke Mills was taken over by the present owners. Later it burned to the ground and was afterwards reconstructed. Subsequently, the Webster and China Mills were

The late treasurer, John P. Reynolds, who had been instrumental in bringing about the consolidation in 1907, was made treasurer at that time and he continued in that office until his death, December 9th, 1920. The making over, during the last twelve years, of the three mills in the Suncook group into a wellequipped, modern, and prosperous cotton manufacturing organization, was carried out under the capable and energetic guidance of Mr. Reynolds. During his treasurership, the Suncook's old machinery was replaced by equipment of the newest and most modern make, including automatic Draper looms, a large percentage of the latter being of the dobby type, to enable the Suncook to change over from a low grade product to the manufacture of a variety of fancy staple gray goods for the converting trade. New mill construction at the Suncook while Mr. Reynolds was treasurer included the erection of a modern three-story brick addition to the China mill and the building of two large and substantial modern concrete dams. corporation's water power was considerably increased in this way, as well as by the purchase of additional flowage rights. Other additions to the China Mill which have been recently completed are a new cotton mixing room and a waste house. Increased facilities afforded by the mixing room in preparing the cotton are, of course, of benefit in the manufacture of an even better quality of cloth than before. Electric equipment is gradually being installed and eventually the entire plant will be operated by motor drives. The use of such power, of course, eliminates the danger liable from belting and does away with overhead shafting. Improvements made while Mr. Reynolds was treasurer of the Suncook were paid for largely out of the earnings of the corporation.

The mill housing problem is one which is being satisfactorily solved at the Suncook Mills. With an eye to the comfort of the employees the corporation has expended a considerable amount of money in remodelling some of the tenements and also in erectheated and provided with bathrooms and hot and cold water facilities. The employees and their families live in these houses at

a moderate rental.

For the last eight years George E. Prest has been the agent. Mr. Prest was formerly with the Bourne Mill at Fall River which produces the same kind of goods which were made at the Suncook almost exclusively at the time when he took charge. For a number of years the Company has been advancing rapidly in its output and has also been put on a firm financial foundation. During the world war, the mill manufactured tenting for the government and for this purpose installed a number of combers. These are at present being used in making new lines for the civilian trade.

Properties valued at over \$2,000,000 are at present owned by the Suncook Mills. The policy of the Company has been to reinvest a large portion of the earnings for new buildings and machinery. At the time when the Company was organized in 1907, the commission house of Wellington, Sears & Co., who have been their selling agents since the year of establishment, became interested in the corporation. With the financial and manufacturing departments in such good condition and with the Company's products merchandised by such an efficient selling house as Wellington, Sears & Co., the Suncook Mills should operate to the advantage of their stockholders. Dividends have been paid regularly on the preferred stock since the time of its issue and on August 15, 1919, dividends on the common stock began to be paid under the new incorporation.

THE WINDSOR PRINT WORKS

This organization had inception in the early part of the ninteenth century and was the first print works to become established in Western Massachusetts, as well as one of the first in the country. When manufacturing pioneers were bringing their industries from the old countries, the founders of the Windsor Print Works came also to this side of the water. In 1829, in a small factory erected the year previous at North Adams, Mass., Caleb B. Turner, the Windsor pioneer, began the printing of cotton goods. Two years later he was joined by a goods. Two years later he was joined by a partner, Walter Laffin. Messrs. Turner and Laflin immediately erected a brick building where they carried on an extensive business, printing cotton goods until the panic of 1837. The plant then remained idle until 1843, but was purchased in that year by James E. and Joseph Marshall, who re-paired and rebuilt in part, then leasing for a term of years to Harvey Arnold and Jerome B. Jackson.

In 1847, before the lease expired, the Hudson Print Works, Joseph Marshall, Proprietor, of Hudson, N. Y., was destroyed by fire. This led to an arrangement by which Marshall & Arnold Company's goods were printed by Arnold & Jackson, under the name of "Union Prints." Mr. Marshall continued with Arnold & Jackson until December 31, 1848. He was then sole owner of the Marshall Cotton Mills and the print works property. January 1st, 1849, he sold the entire manufacturing propertycotton mills and print works-to R. H Wells, Joseph L. White, Amasa W. Richardson, and Jerome B. Jackson, who carried on the manufacturing business under the firm name of Wells, White, Richardson & Co. Messrs. Arnold & Jackson rented the Print Works from the new firm and continued printing until 1860, when Mr. Jackson sold his interest to Samuel Gavlord.

In 1863, W. W. Freeman, A. W. Richardson and W. S. Blackinton purchased the Eagle Cotton Mills & Print Works. Soon afterwards L. L. Brown purchased an interest, and the firm became Richardson, Freeman & Co. In 1867, Mr. Richardson sold his interest, and the firm name was changed to W. W. Freeman & Co. The property at this time included the cotton mill called the "Stone Mill," the Estes Mill, the Eagle Mill, and the Print Works. The Print Works portion was gradually enlarged until it had reached a capacity of seven machines. In 1874, Mr. Blackinton having

recently died, the firm name was again changed and became the Freeman Manufacturing Company. On February 5th, 1881, Mr. Freeman sold his interest in the Company to L. L. Brown, his partner, and John Bracewell. John Bracewell resigned his position as superintendent of the Cocheco Print Works, at Dover, N. H., to become agent of the corporation. The Freeman Manufacturing Company attained a high position in the market and came to be looked upon as one of the recognized leaders in printed cotton fabrics, both in the staple and fine sheer cloth. The name was later changed to Windsor Company.

The Windsor Print Works, the direct successor of the Windsor Company, incorporated January 16th, 1907, under Massachusetts laws, with a capital stock of \$1,000,-000, and with officers as follows: Walton Ferguson, president; Charles M. Howard, vice-president; Alfred L. Ferguson, treasurer; P. J. Ashe, clerk; David A. Russell. general manager; and Joseph Bennett, superintendent. The plant of the Windsor Company was taken over immediately and the work of improving and enlarging begun, so that at this writing (1921) the works cover nine acres, and consist of twenty-two brick and four frame buildings, with a floor space of 319,918 square feet. The Company also owns (1921) about nine acres in the heart of North Adams, some fourteen tenements, and the Eagle Mill, a three-story brick mill, used for manufacturing until the Company began to purchase its cloth from outside sources. The present Windsor Print Works is exceptionally well-equipped for bleaching, dyeing and printing. It operates fifteen printing machines, and has a bleaching capacity of thirty-five tons of cloth daily. The equipment is capable of producing a wide range of fabrics. The napping of cotton flannel was first attempted in the U. S. A., here, and the finishing of finest and sheerest goods and percales in white and dyed ground effects. The product of the Company has borne for many years the reputation of being distinctive. The present Company adopted the name of "Windsor," for the reason of the reputation and popularity of its products, which for a long time had been sold under that trade brand.

Until within comparatively few years practically all print cloths, or calicos, as they were then called, ran twenty-four inches in width, and all the printing estab-

lishments were rigged only to handle these grades. The predecessors of the Windsor Print Works, however, were about the first to become aware of the demand for wider prints, and installed machinery for printing goods thirty-six inches in width. During

vious operatives. Mr. Russell, the general manager of the Company since 1902, became connected with the Print Works in 1887 when he entered as a roll boy, subsequently advancing by stages of importance to the highest manufacturing position. Mr.



CHARLES M. HOWARD (deceased)

Late Vice-President of the Windsor Print Works

the first year it turned out from 1000 to 1200 pieces in this construction. It later increased to a daily capacity of 3000 pieces.

There are employed in all the departments about 700 skilled hands of long training in this exacting field. Much of the help is native, many being descendants of pre-

Russell died November 30, 1920, and was succeeded by Joseph Bennett. Mr. Bennett, who is superintendent of the Works, is a native of England, and a graduate of the Technical School, Manchester. He is a fellow of the Chemical Society of Great Britain, a member of the American Chemical Society,

is credited with many inventions, both chemical and mechanical, and recognized as an artistic colorist. In the Windsor Print Works, he installed and conducts a system of industrial democracy and talks to employees' meetings twice a week. He became identified with the establishment in 1896 becoming superintendent eleven years later. During his career he has been the recipient of many honors for his endeavors in color and textile processes.

The late Charles Marvin Howard directed the styling and merchandising of the products for nearly fifty years. Mr. Howard dated Textile Corporation, and is now the Print Works Division of that organization, with Converse & Company as selling agents.

Charles Marvin Howard, late vice-president of the Print Works, was born in Brooklyn, N. Y., July 29th, 1848. His forbears on both sides were settlers in New England, in the early part of the seventeenth and eighteenth centuries, where they were prominent in Colonial affairs, also serving in the army and navy in the early American wars.

The early life of Mr. Howard was spent in Brooklyn and Amherst, Mass. He was educated at the Gunnery School, Washing-



Windsor Print Works, North Adams, Mass.

was conceded to be a man of rare ability and foremost in his field, and his death in 1918 was a loss, not only to the Company, but to the industry in general. He has been succeeded by his son, Frederick T. Howard, who was closely associated with him for nearly twenty-five years.

The present (1921) officers are: President, F. K. Rufprecht; vice-president, Alfred M. Ferguson; treasurer, Sherburne Prescott; clerk, P. J. Ashe; general manager, A. W. Craig; superintendent, Joseph A. Bennett.

On December 31, 1919, the Windsor Print Works was purchased by the Consoliton, Conn., and entered the wholesale dry goods business with the firm of Andrus & Bower at the age of sixteen. His later affiliations were with Pomeroy & Plummer, Geo. C. Richardson & Co, Brown, Wood & Kingman, and P. Van Voldkenburgh & Co. as agents for the Freeman Manufacturing Co., the predecessors of the present Windsor Print Works. He was a man of unusual taste, indispensable to successful styling, combined with rare merchandising ability, an indefatigable worker, a man of the highest integrity, charitable, generous, and sympathetic to all with whom he was brought into contact.

WILLIAM SKINNER & SONS

Stretched out over several city blocks in Holyoke, Massachusetts, there stands a group of mills founded by a man whose name from the late forties down to the present day has been a synonym for silks and satins—William Skinner. About these mills and about that man are woven a vivid story that does the heart good to tell. To read it is to know the history of silk manufacturing in America and to feel a thrill of pride, too, in the success of the enterprise.

Gone these past twenty years, the splendid spirit of William Skinner still survives in Holyoke whence come the silks, satins and taffetas bearing the trademark that is

from London, England, where in the year 1824 he first saw the light of day. At that time such silk as was used in this country came for the most part from England and France, for the silk manufacturing industry here was still in its infancy. Sewing silk was made in a few mills, but that was about as far as the industry had progressed.

In 1848 Mr. Skinner began the dyeing of silk in Northampton, Mass., shortly after removing to what later became known as Skinnerville, when he commenced manufacturing and dyeing sewing silks. This venture was successful and the business steadily

grew



Mills of William Skinner & Sons, Holycke, Mass.

known and trusted wherever silks and satins are sold or worn—the head of the famous old Indian chieftain, Unquomonk, of the Agawam tribe, which formerly inhabited western Massachusetts. A watchful sentinel, it has held steady and guided the hands of those to whom William Skinner bequeathed an untarnished name imperishable in the annals of the textile industry of America; it has shaped and moulded the Skinner policy; it has added lustre to that homely old saying, "Honesty is the best policy". In a word, William Skinner's spirit has made the firm of William Skinner & Sons what it is today.

Europe had long since learned the art of silk weaving when William Skinner, then nineteen years of age, came to America As prosperity came to William Skinner there sprang up around his factories a happy little community known as "Skinnerville". Here in 1874 William Skinner had become "monarch of all he surveyed" and was one of the leading manufacturers of Massachusetts as well. He had built for himself a handsome home situated within a stone's throw of his mills, and, to crown it all, his future seemed bright with even greater promise. But now there lurked a shadow of an overwhelming disaster.

On the morning of May 16, 1874, the Williamsburg reservoir, five miles above Skinnerville, burst its earthwork dam and sent its vast volume of water down the peaceful valley. Almost 200 persons lost their lives in that raging stream; the village,

mills, houses and all, were wiped out, and William Skinner was stripped of all he had.

The death list in this disaster would have been even more appalling had it not been for the heroism of two men. Racing their horses down the valley, ahead of the oncoming flood, these two heroes—one the reservoir watchman and the other a milk wagon driver—spread the alarm that saved several thousand men, women and children.

several thousand men, women and children. It was not in the Skinner code to give way to despair, and, recovering from the first shock, William Skinner resolved that again he would make a fresh start. At this time Holyoke, then incorporated only a few years, was seeking new industries, and the high standing of William Skinner prompted the Holyoke Water Power Co. to ask him to build a mill in that city. It was only a small mill as compared with the present Skinner plant, but it proved the nucleus of a business that prospered from the very beginning. This growth continued to the present proportions of the Skinner establishment with its 3,000 operatives.

Holyoke is proud of the Skinner mills and proud, too, to keep fresh the memory of William Skinner, for he was not only a manufacturer of the first rank, but a generous benefactor, a leader in the support of all worthy charities. His contributions to the Holyoke City Hospital, the churches, the Holyoke Public Library and other institutions were without end and his kindly acts were without number. When in 1902 he passed away there were hundreds of saddened homes in the thriving community for which he had done so much.

The Skinner homestead in Skinnerville had been slightly damaged in the flood, but so greatly was he attached to the place that he removed it to Holyoke, where it was rebuilt. It remains the Skinner residence, on Pine street, known as Wistaria-hurst.

Meanwhile the firm of William Skinner & Sons has followed in the footsteps of its founder, holding fast to those principles of strict integrity. As William Skinner used to do they use only pure silk in the manufacture of their products. These go everywhere, finding their way to the ultimate consumer, who asks for nothing more than to see the name "Skinner's Silk" or "Skinner's

Satin" woven in the selvage as a mark of identity. Skinner's Silks and Skinner's Satins were the first in the world to be guaranteed as to wearing quality as well as the first to have the name woven in the selvage. It is the Skinner guarantee that the goods have all the soft, natural lustre of the original silk fibre, free from injurious and dishonest treatment that produces artificial gloss.



Trademark of William Skinner & Sons

This guarantee is made possible only through a most exacting process. William Skinner & Sons have their own inspectors stationed in Japan and Italy, whose duty it is to accept only the full-sized and strongest raw silk, while at the Holyoke mills every yard of finished silk is closely examined by three different sets of inspectors before it is shipped to the purchaser. No imperfections can escape; hence the guarantee of durability.

Pure silk is the most durable fibre known. It has been found in the tombs of the Pharaohs still as good as when it was placed there ages ago. Bobbins of Skinner Silk are still being plowed up by the farmers of the Mill River Valley from the ground in which they were carried after the Skinner-ville flood of 1874, the silk to this day retaining its life and tensile strength though the wooden spools had long since crumbled away.

Surely, could William Skinner come back to Mill Valley, he would say that he had builded well, and could he come back to Holyoke he would say he could not have left the fruits of his life work in better hands.

THE DU PONT TECHNICAL LABORATORY

By DR. R. E. ROSE

While the public has heard a great deal about the chemistry and manufacture of dyestuffs since America began to develop its new dyestuff industry, there is one feature, an "application laboratory," peculiar to this industry, which has received little attention. Yet to the visitor, it is in many ways the most interesting, because the most comprehensible, portion of a dye plant.

While for half a century the chemist in

While for half a century the chemist in his laboratory has studied and carried on experiments with the hope of producing new dyestuffs, his colleague in the technical laboratory has examined these discoveries for qualifications that would justify manufacture; and it is necessary to add that very few of all the colors that have been invented have been found suitable for com-

merce.

The dyestuff manufacturer knows, but few other people realize, that every batch of dyestuff that comes from the plant, whether of a recently introduced color or one that has been produced for years, has to be tested for shade, strength, solubility and other properties; that is, it is standardized—tested against a sample of the color that has been chosen as satisfactory. It must come up to this standard in every respect before it goes out to the consumer. This standardizing is carried out by the technical laboratory.

The function of the technical laboratory which is most familiar to the users of dyestuffs is the service given the consumer in working out his coloring problems. When the consumer wishes to produce particular shades on his goods in various stages of manufacture, the technical laboratory matches these, doing the dyeing on a dyeing machine which is a model of his own factory equipment. The results of experiments are submitted to the consumer for

his use.

As each dyestuff has peculiarities all its own, in application as well as fastness properties, it follows that the personnel of a technical laboratory, to carry on such work as just mentioned, must consist of men of long experience in specific industries in

which dyestuffs are used.

American dyestuffs manufacturers realized that the successful production of dyestuffs comparable in quality with those of foreign manufacture, required profound chemical knowledge and mechanical skill of a high order. They knew, also, that it was necessary to develop a service organi-

zation with equipment and ability to demonstrate the high quality of American

products.

All Du Pont salesmen receive a course of training at the Du Pont Technical Laboratory before going out to the trade. Demonstrators also receive a similar but much more intensive and specialized training, during which experimental and technical problems in a certain field, such as paper, leather, or textile dyeing, are studied.

Connected with this Laboratory is a competent staff of demonstrators, who call on the trade regularly and also keep in close touch with the work of the laboratories. In their work in the field they frequently encounter difficult technical problems, in which case they return to the Laboratory to carry out special work on them.

As a part of its service to customers, the staff of this laboratory also issues from time to time illustrative pattern cards, circulars and samples.

The Laboratory is a building of two stories, set in a delightful garden of perennial flowers and old trees, over-looking the Delaware River from a location just outside the Dye Works area at Deepwater Point,

New Jersey.

On the main floor are the executive offices, library, rest-rooms, showers, and locker-rooms for the employees. Here, also, are offices for the use of the salesmen, who visit the Laboratory at regular intervals to review the work carried on during their absence and to become better acquainted with the new products as they are developed.

At the north end of this floor is a spacious, well-lighted room, equipped with power machines for winding yarns. In this room operators wind and accurately weigh the skeins which are used for experimental dye testing, and also make the small bows.

used on sample cards.

At the south end of the building is an analytical laboratory equipped for identifying unkown dyes and for determining various chemical properties of dyestuffs, such as are not investigated during the ordinary course of dye testing. Across the corridor is a large room used for meetings and assemblies.

The equipment and the operations carried out in the laboratories on the second floor are more interesting to the visitor. He is apt to notice first that architects have pro-

vided abundant air space, the entire floor being open to the roof except for glass partitions, ten feet high, between communi-

cating rooms.

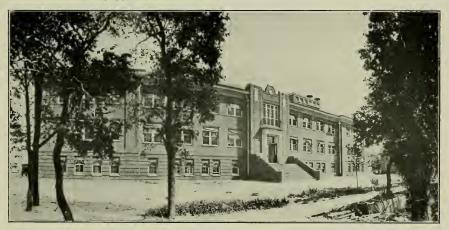
At the north end of this floor is a laboratory devoted to the testing of dyestuffs suitable for textiles. The dyeing is carried out in small porcelain cups, uniformly heated in specially designed ovens, accurately weighed portions of dyestuffs being applied to weighed skeins of yarn. Each worker has his own table space and desk and devotes his attention entirely to the testing operations.

The directors of this laboratory have

their office in an adjoining room.

On the west side of the building is a paper laboratory, equipped with miniature Across the hall is a lake laboratory, where dyestuffs are converted into pigments for paints, printing and lithographic inks, wall papers and other uses.

At the south end of the building is an experimental dye-house fitted with textile mill apparatus of various varieties—machines designed to dye raw stock, hosiery, cops, tops, warps, pieces, yarns or any forms of materials used in the textile trades. These machines are practical working models, capable of handling, on an average, ten pounds of material. There are also hydroextractors and driers, as well as jigs and padding machines, and two calico printing machines with steamers make it possible to carry out extensive work along the lines of textile printing.



The Du Pont Laboratory at Deepwater Point, New Jersey

beaters, driers, and a line of stirrers for beating small test lots of paper pulp, and suction screens for converting this pulp into sheets of paper. Samples of paper submitted by customers are accurately matched for shade, so that the paper manufacturer may have a definite idea how he can utilize Du Pont dyestuffs in his mill. A large beater and twenty-inch paper machine will be installed in the basement and will be operated continously to furnish stock for sample books and general advertising matter.

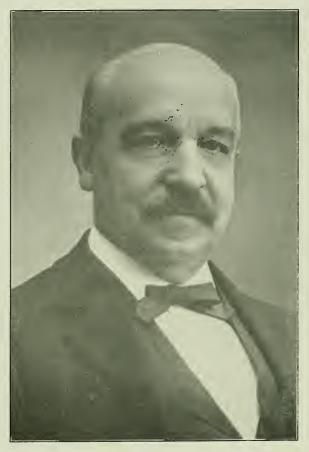
Adjacent to this is the office shared by the director of this laboratory and the director of the leather laboratory which adjoins it on the other side. Each of these laboratories is served by a weighing room. The heavier pieces of machinery, such as leather drums, glazing machines, paper beaters, and a paper machine with its calender rolls, the heating system, the machinery that supplies the building with its compressed air and vacuum service lines, and a photographic dark room, equipped with photo-micrographic apparatus and projector, are in the basement.

It is quite evident that the work of this Laboratory, covering as it does the control of the quality of shipments, matching customers' samples, working out coloring problems and supplying advertising matter or information for salesmen and consumer, holds a place of great importance in the development of the dyestuff industry in America.

J. H. LANE & CO.

The corporation which today bears the name of J. H. Lane is a house of substantial build and is the medium of distribution for

Mills, Unity Spinning Mills, Elm City Cotton Mills, and Hillside Cotton Mills at LaGrange, Georgia, the Milstead Manufacturing Com-



J. H. LANE

the entire production of a long list of mills including the big plant of the West Boylston Manufacturing Company at Easthampton, Mass., the Callaway group—Unity Cotton pany at Conyers, Georgia, and the Manchester Cotton Mills at Manchester, Georgia —and the Crown Cotton Mills of Dalton, Georgia.

Though the firm's reputation does not rest upon any one description of goods, from the days of the bicycle through to the universal adoption of motor transportation they have been very active in the supply of tire fabrics. In order to trace the antecedents of J. H. Lane & Company, one must go back to the sixties. About 1862, J. H. Lane, one of the best known New York textile merchants in the last decade of the 19th century, became a partner in Ammidown, Lane & Company, then at 87-89 Leonard street. After a number of years he retired from that business and, on Jan. 1, 1883, established a new partnership with Henry W. Richardson, known as J. H. Lane & Company. They were situated at 110 Worth street, where they remained for thirty years. Mr. Richardson died a few years after his retirement in

1888, and as time passed new partners were brought into the firm, the first of whom was James W. Lane. Then in 1893, F. Coit Johnson and James Freeman Brown entered the business, the latter retiring in 1898. The firm was incorporated in 1903. F. Coit Johnson became president and E. W. Spurr, vice-president, in 1905, upon the retirement of Mr. Lane, whose death occurred the following year. A likeness of the elder Mr. Lane, shown on another page, bears witness to the strong personality of the man.

Other present officers of the corporation are F. H. Babcock, vice-president; James W. Lane, treasurer; and J. M. Tallman, secretary. Their spacious business quarters in the uptown textile district are at 334 Fourth avenue. Branch offices are main-

tained in Boston and Chicago.

MINDLIN & ROSENMAN

Good merchandise and prompt attention to orders plus hard work have been the determining factors in the success of Mindlin & Rosenman, importers of cotton yarn, tinsel thread and artificial silk and manufacturers and throwsters of tram and organzine for the silk manufacturing and knitting industries.

Established in 1899, the firm of Mindlin & Rosenman has marched steadily forward, building up an ever increasing business by virtue of the sound principles already

stated. The two partners, Mr. Mindlin and Mr. Rosenman, are dyed-in-the-wool, twenty-four carat business men who don't work by the clock, and are always easily accessible to their customers. Their head-quarters is at Nos. 105-107 East Twenty-ninth street, New York.

Mindlin & Rosenman operate three mills, one at Scranton, Pennsylvania, another at Dunmore, Pennsylvania, and the third just outside of Manhattan, on Long Island. They also have a branch office in Philadelphia.

FALES & JENKS MACHINE CO.

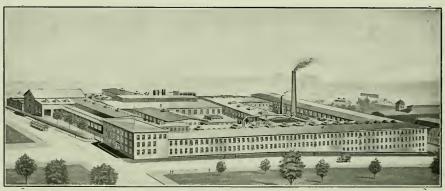
When the firm of Fales & Jenks began business in 1830 its predecessors had been iron workers for generations. David G. Fales was a direct descendant of James Fales, who came from Chester, England, to Dedham, Mass., and on September 10, 1636, signed the original Dedham Plantation Covenant. When a young man of eighten David G. Fales came to Central Falls, Rhode Island, and learned the machinist's trade in the shops of David Jenks & Co. Alvin Jenks was a direct descendant of Joseph Jenks, of Lynn, who came to America with Governor Winthrop, the younger,

built the first house in Pawtucket, and served as "assistant" many years in the General Assembly at Newport.

The Jenks family have been engaged in iron founding and manufacturing without interruption, from the days of Joseph Jenks

of Lynn to the present time.

Alvin Jenks moved to Central Falls from Pawtucket, and in 1830 entered into partnership with his brother-in-law, David G. Fales, under the firm name of Fales & Jenks in a shop owned by Ruel Richards & Co. The founders of this Company were noted for their rare mechanical skill, sound



Works of Fales & Jenks Machine Co., Pawtucket, R. I.

in 1642, and established at Lynn, Mass., in the following year the first iron and steel works on the Western Continent. In 1646 Joseph Jenks obtained from the General Court of Massachusetts Bay Colony the first patent granted in America. His son, Joseph Jenks, Jr., went into the Colony of Rhode Island in 1669 and in 1671 built the first forge in that colony at Pawtucket Falls. Besides the forge shop he also operated a sawmill and carpenter shop and later built an iron furnace. Here much of the iron manufacturing of the Providence Plantations was carried on for a century or more until the steam engine rendered manufacturing independent of water power. Joseph Jenks, Jr.,

judgment and sterling integrity of character.

The first machine constructed by them was a spooler made for Cunningham & Anderson of Richmond, Va., and sold for \$60. During the first two years of their existence they manufactured cotton spinning and thread making machinery, but in 1833 they began the manufacture of Hubbard's patent rotary pump, which was considered the best pump in use for many years. A few of these pumps are still made in the factory today, but this is now a very small part of the business. From the first the firm has continued to build and develop various kinds of cotton machinery. During the early years

Alvin Jenks perfected ring spinning, which later revolutionized spinning methods throughout the world. In 1845 the firm had begun the regular manufacture of ring frames, and in the following year made ring twisters the first machines of the kind.

Alvin F. Jenks and John R. Fales, sons of the founders, were admitted to partnership in 1854, and the firm name changed to Fales, Jenks & Sons. On the death of the elder Mr. Jenks in 1856, another of his sons, Stephen A. Jenks, was taken into the firm.

Previous to 1860 they had purchased their castings from other establishments, but in 1859 they built their own furnace in Central Falls and soon after erected a spacious machine shop. There was little change in the product of the plant until the outbreak of the Civil War, when, in response to an urgent demand they began the manufacture of milling machines used in the manufacture of fire arms. At length the growth of the business required them to enlarge their accomodations. Accordingly, in 1865 they bought a tract of land in Pawtucket, embracing over fifty acres, and having sold the plant in Central Falls, they erected new buildings into which they moved their business in 1866. They now added the manufacture of plunger pumps, turbine water wheels, water meters, safety valves, hydrants, water pipe and fittings, shafting, pulleys, railway safety gates and all kinds of foundry work.

In 1866 the firm built an order of ring twisters, spoolers and winders for J. & P. Coats, Paisley, Scotland, the celebrated makers of Coats' thread. These machines were superior to anything made in Europe and later served as models for machines in other Coats establishments. In 1871 when the single rail spindle came into use the firm introduced a new type of spindle rail commonly known as the "box rail," and a year later brought out the geared head drive, an improvement over the belt drive. In 1876 the business was incorporated as Fales & Jenks Machine Co., with Alvin F. Jenks, president; John R. Fales, vice-president; and Stephen A. Jenks, treasurer. In 1878 Frank J. Rabbeth, head spindle maker, perfected and brought out the Rabbeth Top

Spindle, and in 1881 Albert R. Sherman, also an employee of Fales & Jenks Machine Co., patented the spindle commonly known as the Sherman or Flexible Spindle.

In 1883 Albert A. Jenks acquired an interest in the company and in 1891 LeRoy Fales became a stockholder, and on the death of his father in 1896 became secretary of the company. On the retirement of Alvin F. Jenks in 1898 his son, Albert A. Jenks, became president. In 1910 Herbert G. Beede, a grandson of Alvin Jenks, and William H. Armstrong became stockholders in the concern. In 1913 on the death of Stephen A. Jenks, LeRoy Fales became vice-president, Herbert G. Beede, secretary and general manager, and Frederic W. Easton, treasurer. On the death of LeRoy Fales in 1920 his son, J. Richmond Fales, succeeded him as vice-president, and on the retirement of Albert A. Jenks in the same year his son, Robert R. Jenks, became president.

The plant has continued to grow until an area of more than eight acres is now occupied by the foundry, warehouses and machine shops. At the present time practically the entire energies of the concern are devoted to the manufacture of ring spinning and twisting machinery, in which field they have always been pioneers and leaders. In 1907 the company introduced and began the manufacture of the present form of tape driven spindles for their ring spinning and twisting machinery. This innovation has been considered one of the most important developments in this type of machinery since the introduction of the "top spindle" in 1878, and has proven an important factor in the development of the present tire fabric machinery, besides largely increasing the uses of ring twisting.

In 1918 certain stockholders of Fales & Jenks Machine Co. and their associates purchased and reorganized the Woonsocket Machine & Press Co., Inc., of Woonsocket, Rhode Island. Herbert G. Beede was chosen president; J. Richmond Fales, vice-president, and two years later Robert R. Jenks became treasurer. By this move Fales & Jenks Machine Co. with several associated and allied concerns are now prepared to supply complete cotton mill equipment for both domestic and foreign markets.

A. M. HINMAN CORP.

An industry, no more than an individual, can always escape scot-free from the shafts of criticism, and the textile industry has not been exempt in this respect. The chief complaint has been that Americans were inexpert in the art of baling and packing goods for export. But Arthur M. Hinman, president of the A. M. Hinman Corporation, Nos. 8-10 White street, New York City, is changing all that. He is the originator of a baling and packing process which has won the enthusiastic indorsement of no less a beneficiary than the United States Government. Employed during the war with Germany, Hinman's plan, it has been officially estimated at Washington, effected during that period, a saving to the government of more than \$50,000,000 in ocean freight alone, besides another \$5,000,000 in collateral expenses. The magnitude of the achievement is instantly apparent in the proven statement that it enabled the government to make one ship do the work of two under the old system.

Mr. Hinman is not an egotistical man, but he does believe that just as soon as the entire textile industry can be prevailed upon to pack and ship merchandise the way he packs and ships it, the results will be so eminently gratifying that exporters will wonder how they ever got along at all without it. Esteeming as he does the judgment of the American business man, he says he knows that day is coming, for the revolu-

tion has already begun.

While Mr. Hinman was well-known as a baler and packer and dry goods refolder before the War Industries Board heard of him, his present prestige is far greater than before he went to Washington and gave generously of his time to help Uncle Sam keep down the bills. Just what he accomplished for the government is set forth in an official report made by Captain H. R. Moody of the Quartermaster's Department of the United States Army. This report tabulated the saving on the shipment in 1918 of 1,000,000 bales of clothing from New York, as follows: Material, \$1,940,-000; labor, \$583,000; tare weight, \$75,-000; cargo space, \$49,080,000; rent and maintenance, \$700,000; freight to warehouses, \$490,000; warehouse room, \$30,-000; freight from warehouses, \$1,250,000; recooperage, \$200,000; unloading, \$1,000-000.

Here was a grand total of \$55,348,000, representing one item alone, and it paved the way to further large savings to the gov-

ernment; for once Mr. Hinman had demonstrated how it was done, the same methods began to be widely adopted in the baling and packing of nearly all compressible goods going abroad. Aside from the economy, they served as oil to troubled waters, for under the old more or less slip-shod system the condition of goods upon their arrival at their various destinations frequently was such as to bring down on the head of the American shipper maledictions in many tongues; in fact, there was so much irritation on this score that not infrequently there was a severance of relations of the two parties concerned. On the other hand, Germany, of all the nations engaged in international trade was reaping the benefits of first rank as an expert in the packing of merchandise for transportation over long

distances by the water route.

This was the situation when Mr. Hinman along about 1910 succeeded to the packing business of Hubert Van Wagenen. A small single building at No. 159 Duane street then sufficed for all needs, though the business had been established in 1844 at Old Slip. Mr. Hinman saw an opportunity for big improvement and found out how this improvement could be accomplished. There was nothing intricate in his solution; it was the simple, common sense idea of compressing goods to a "high density," into a smaller space than they occupied before. This process as employed by Mr. Hinman consists of taking loosely packed articles such as blankets, coats, overcoats, etc.-anything at all in the dry goods line which is of a compressable nature-and placing them under pressure between a 200-ton hydraulic press, baling them into conveniently handled packages, covering the same with burlap or other bagging and tightly securing with iron or wire bands. Some packages are reduced as much as fifty per cent. In the Hinman dry goods refolding department the original fold, or "put up," is skilfully changed to the fold required by the various trades.

To see a consignment of goods unloaded loosely at the Hinman plant and again when it has been compressed into the minimum of space seems to the uninitiated nothing short of legerdemain; and a visit to the Hinman headquarters on White street, or to the two Broadway warehouses affords a good understanding of how fast the Hinman idea is taking hold. But in spite of his large patronage Mr. Hinman realizes that he has done little more than scratch the surface;

American textile manufacturers, merchants and exporters are now at grips with foreign competitors as never before and cannot afford to overlook such a vastly important consideration as the proper and most economical method by which to send their merchandise across the seas.

and everything. But we must impress the foreign mind with the thoroughness of our work. A neat, tightly packed bale or crate of goods is an advertisement of the efficiency of the concern from which it comes, and also of the respect in which the sender holds the recipient."



ARTHUR M. HINMAN

Ten years ago the Hinman plant was operated with one hydraulic press; now it has six. Ten years ago it had one machine for yarding and one machine for folding; now there are fourteen to do yarding and folding.

"We have in this country," says Mr. Hinman, "the goods, quality, quantity, price

Mr. Hinman himself practices the same thoroughness which he commends to others; his sharp eye watches every move at the Hinman plant, and things must be done right. Mr. Hinman was born in Brooklyn, N. Y., and married a Brooklyn girl, Miss Julia Maloney, in 1905. They have three children, two boys and a girl.

A. D. JUILLIARD & CO.

When Augustus D. Juilliard ceased to be a living personality amid the scenes of New York's commercial, financial, and social life, the loss was such as produces that profound effect occasioned by the passing of a leader of men. Not that material organization does not go on as ever, but so strong an impress do some chosen few of men make upon the minds and hearts of their time that the inevitable final absence is never anticipated and scarcely realized when it does come. Mr. Juilliard died on the night of April 25, 1919.

Every participator in the ramified affairs of the textile industry will think of A. D. Juilliard and A. D. Juilliard & Company together, and indeed the one was in large measure the other. The senior partner of the company was, in his professional life, first and foremost a textile merchant, one who was justly honored as representing the highest level of attainment. All the more to the credit of the industry, and indispensable to a full understanding of the man, was the fact that his ideals, sympathies, and as-

sociations, linked him to a wide-embracing circle of enterprises. It is the present purpose to indicate briefly the diversified char-

acter of his service.

The Juilliard family, of French Huguenot stock, traces its antecedents back to the middle ages in France. Laurent Juilhard du Jarry, a celebrated ecclesiastic, poet, and orator, who died in Paris in 1730, was an early scion. The Juilliards were a strongminded, liberty-loving race who had a hand in the making of French history. Pierre Juilliard, the grandfather, and Jean Nicholas Juilliard, the father of A. D. Juilliard, fought in the campaigns of Napoleon, in which the former lost his life. Jean Nicholas and his wife found living conditions in Burgundy oppressive and contrary to their strong republican sentiments after the French Revolution of 1830 and were impelled to seek a happier environment in America, settling at Canton, Ohio, in 1836. Born in that small Ohio city, young Augustus D. Juilliard had no more advantages than the untold numbers of youths who leave the interior to gratify their ambitions in New York.

Mr. Juilliard's arrival in the metropolis was unheralded. He selected at once the vocation which ever remained foremost among his interests, obtaining modest employment in a textile commission house. Further on came opportunities with the firm, very influential in its day, of Hoyt, Spragues & Company. The business suffered severely by the panic of 1873, in fact to the extent that a receiver was appointed in the person of Mr. Juilliard. The sagacity shown by the manner of his discharging this responsibility first revealed him as a man of superior talents. Out of the incident grew A. D. Juilliard & Company, formed soon after, which pressed rapidly forward to the ascendency it now shares with the few largest manufacturers and distributors of textiles; a house whose mills, products-cottons, woolens, silks, broadcloths, dress goods, yarns, etc.—and methods of business, have long exemplified the principles upon which permanent mercantile success is founded.

Mr. Juilliard's judgment was highly esteemed by textile men and his counsel was potent outside the precincts of his own firm. He had as his associates, Chester A. Braman, Frederic A. Juilliard, his nephew, Duncan D. Stephen, Philip Smith, Robert Westaway, and Frederick W. Johnson, men whose names bear the weight of decades of acquired knowledge and experience, and who now conduct the business of A. D. Juilliard & Company.

Mr. Juilliard had pronounced opinions on national affairs, especially as they affected the country's industries. In accordance with his undeviating allegiance to the Republican party, he was a firm believer in protection for long industries as against foreign com-

petition and staunchly advocated that a greater degree of protection be included in the measures of reconstruction following the

An idea of Mr. Juilliard's standing in finance, extraneous to textiles, may be gathered from the statement of his connections with various banks and companies. He was senior member of the board of directors, and trustee of the Guaranty Trust Company of New York; a trustee of the Central Union Trust Company, Title Guarantee & Trust Co., New York Life Insurance and Trust Company, and the Mutual Life Insurance Company of New York; a director of the National Bank of Commerce, the Chemical National Bank, the Bank of America, the Atchison, Topeka & Santa Fé Railroad, Southern Railway Company, the Realty Associates, and the North British and Mercan-

tile Insurance Company.

A debt of gratitude is owing to the memory of Mr. Juilliard on the part of all who have derived good from the existence of the nation's principal shrine of grand opera, the Metropolitan Opera House of New York. His love for that institution endured through twenty-five years of constant attendance to its financial direction, during which he served as president of the board of directors and signally aided in times of threatened disaster. He was present at the majority of performances and was rightly regarded as one of the most helpful and sincere supporters of the cause of music in America. His parting gift was a bequest setting aside the residuary of his estate, conservatively estimated at five million dollars, for the establishment of the Juilliard Musical Foundation, which is to provide musical education for students of limited means, at existing schools or at others hereafter to be created. and from individual instructors here and abroad. Furthermore, the trustees of the Foundation are empowered to use its funds for arranging, without profit to it, concerts, musical entertainments, and recitals, for the pleasure and profit of the public, and additional financial aid is stipulated for the Met-

ropolitan Opera Company.

The Juilliard Musical Foundation is said to be the greatest single bequest ever made for the promotion of musical education and culture. This princely endowment cannot but be of incalculable benefit to the recipients of its privileges and the musical public. The will contained other generous bequests, among which were one hundred thousand dollars each to the American Museum of Natural History, the New York Orthopaedic Dispensary and Hospital, the Society of the New York Hospital, the Lincoln Hospital and Home, the New York Society for the Prevention of Cruelty to Children, St. John's Guild of New York City, and the Tuxedo Hospital of Tuxedo Park, New York-all indicating the donor's devotion to the welfare of humanitarian movements.

Mr. Juilliard's appreciation of the arts and sciences was extended to many domains. He was a trustee of the American Museum of Natural History, and a member of the Metropolitan Museum of Art, the American Geographical Society, the American Fine Arts Society, and the Ohio Geographical So-

ciety.

Mr. Juilliard was married in 1877 to Miss Helen Cossitt, daughter of the late Mr. and Mrs. Frederick H. Cossitt, of New York. Mrs. Juilliard died in April, 1916. There

were no children.

A few of the many societies in which Mr. Juilliard's name appears are the Huguenot Society, the Ohio Society of New York, the Union League, New York Athletic, Tuxedo, Automobile, Sleepy Hollow, Republican, and Merchants Clubs.

The press described Mr. Juilliard as a man of force in the financial and mercantile worlds, which was an accurate observation of his relation to the textile industry where that force was exerted with constructive effect. He was one of the makers of the his-

tory of American textiles.

DAVID BROWN CO.

The David Brown Co. of Lawrence, Mass., was organized in that city as the Weld Bobbin & Spool Co., in 1899 by David Brown, and incorporated in Maine. In 1913, the name was changed to The David Brown Co., and reincorporated under the laws of Massachusetts. David Brown was the founder and has always been the head of the business. He has been ably assisted by his son, George Gibson Brown, for the last fourteen years. Their product is a full line of bobbins and spools of all kinds for textile mills and their motto "High Grade" is justly taken. At the Panama-Pacific Exposition at San Francisco in 1915, they were awarded the "Gold Medal" for their "Quality" exhibit. Since the business was started they have always run to capacity, a fact which in itself is recommendation lines of bobbins and spools. Their product is known all over the United States, Canada, and Mexico, is exported to South America, and includes several patents of their own.

The Union Shuttle Co., of Lawrence, Mass., is owned and operated by David Brown. It was originally organized in 1883 and is still doing the same "quality business." Quantity production has never been the rule, but rather "Quality" and "Merit Counts." David Brown was the original inventor of the first hand threading or self-threading shuttle which has today replaced the old style suck or "kiss of death" type. In 1884 the Union Shuttle Co. was awarded the silver medal by the Massachusetts Charitable Mechanics Association of Boston. This record should speak for itself and does so in their long list of satisfied customers.



Plant of the David Brown Company, Lawrence, Mass.

enough for their product. The volume of their output has tripled in the last ten years and is still growing by leaps and bounds. Their capitalization is over \$200,000 and the annual volume of business about \$750,000.

The plant group of buildings, in which 200 are employed, is one of the best equipped in the business and also one of the largest (see cut). The best and latest types of machines, a new dry kiln building just finished and capable of drying at one time one million bobbins, a large and complete stock of the best lumber obtainable, and an efficient and personal management, make for an establishment second to none in the bobbin or spool business. A new catalogue brought out in 1919, describing their bobbins, spools and shuttles, is sufficient proof of the progressiveness of the concern. One of their specialties consists of all kinds of metal reinforcements for various types and They carry an exceptionally large stock of seasoned shuttle blocks and shuttle parts and are fully equipped to take care of their trade. Woolen and worsted shuttles comprise a large part of their production, but a great quantity of cotton, duck tire fabric, carpet, and other types is also made. The plant is in the same group of factory building as the David Brown Co., and under the same efficient management.

Lifelong experience, constant application, and thorough knowledge of the business, the Company regard as the strongest factors in bringing them success. Personal service given the customers by the owners has also contributed to their progress. The Company believe in advertising and employ trade papers, a catalogue, calenders, novelties, etc., for this purpose. The officers of the Company are David Brown, president and treasurer, and George G. Brown, assistant treasurer and manager.

PISCATAQUIS WOOLEN CO.

Attending strictly to business and exerting every effort to satisfy customers, have been strong factors in the success of the Piscataquis Woolen Co., Guilford, Me. In spite of a long freight and express haul, the Company has prospered so that in recent

Z. L. Turner. Water power, available at a very small expense, and good help have contributed to the Company's success. About 130 hands are employed. The product is men's and women's wear woolens. Specialties are ladies' fancy coatings and suitings.



Plant of the Piscataquis Woolen Company, Guilford, Maine

years the percentage of increase has been twenty per cent. The motto is to make and deliver goods up to sample and keep contracts, which has won the respect of customers. The Company was established in Guilford in 1881 by Henry Douglass, D. R. Straw, M. L. Hussey, John R. Pollock, and

The trade territory is the United States. The annual turnover is \$500,000 and the capitalization \$120,000.

The present officers are: President, M. L. Hussey; treasurer, C. S. Douglass; agent and general manager, John Houston; and superintendent, R. C. Houston.

STEPHENSON MANUFACTURING CO.

The Stephenson Manufacturing Company is well and favorably known in the textile industry for its product—belt dressing. Established in 1888 and incorporated in 1897, this Albany concern has a trade territory embracing the United States, Canada, South America, England, France, Italy, Japan, India, Australia, Dutch West Indies, Philippine Islands, Cuba and South Africa. Its officers are E. L. Kellogg, president; S. A. Kellogg, vice-president; B. L. Kellogg, treasurer; and F. L. Kellogg, secretary. It bids for business largely through calling at

tention to the fact that "No one kind of dressing is good for all kinds of belts." Stephenson is made in different form for different needs.

Maintenance of high quality, protection of jobbers and dealers and coöperation with them and immediate shipments are some of the factors that have brought success to the company. It adheres strictly to two rules—Never to cut a price, and never to sell on trial. It goes on the principle that if an article is good and has merit it should sell outright.

PUTNAM-HOOKER CO.

Service—based on the conviction that to succeed their mills must be successful—has been the underlying factor in bringing prosperity to the Putnam-Hooker Co., now lo-York City. The Putnam-Hooker Co., Inc., are cotton goods commission merchants, handling for various mills, gray and colored, woven and piece dyed cotton fabrics, as well as yarn, carpet warps and cotton batting. The specialties which the Company sells are ducks, osnaburg, toweling, drills, denims and khaki drills. Although the concern handles the products of many mills, they have not a dollar interest in any of them, regarding it a better policy to conduct their business altogether on separate lines. Their organization throughout is made up of vigorous young men and they regard them as among their strongest assets. Furthermore, the business has a prestige arising out of fifty-five years of existence and experience. The concern has successfully weathered the panics which fell upon the country since the foundation of the business.

The Putnam-Hooker Co. is a successor to the firm of B. T. Stone & Co., which was established in Cincinnati, Ohio, in 1842. This Company acted as forwarding agents in the old river days. It was in 1842 that B. T. Stone, a Vermonter, who had gone to New Orleans to seek his fortune, heard glowing accounts of business possibilities in the Central West. He embarked on one of the steam boats between New Orleans and Cincinnati and, landing at the latter city. established the business mentioned above. Merchandise which was transported by boat from Pittsburgh and from New Orleans was sent forward to the interior of Ohio, Indiana and the West by the few railroads which existed at that time, by the Miami and Erie Canal, or by steamboats. The rapid development of the country made it necessary to hold a stock of merchandise at Cincinnati ready for the market. In this way the transition from the forwarding business to the

commission business was natural and a step which was accomplished without difficulty.

In the year 1853 Benjamin W. Putnam, also of Vermont, a nephew of Mr. Stone. joined him in the business, and eleven years tater, James J. Hooker, a Cincinnati boy, seventeen years old, the son of a friend of Mr. Stone, took a position with the firm. In 1865 Mr. Stone organized the Fourth National Bank of Cincinnati, becoming its president, and the management of the business he had founded was turned over to the younger men. Progress was rapid. In 1866 Mr. Stone retired, and the firm of Putnam, Hooker & Co. was organized. This partnership continued until 1902, when the Company was incorporated. Since 1905, an active branch office was maintained in New York, until February 1st, 1920, when the executive and accounting departments were removed to New York, and the headquarters of the business established at 87 Leonard Street, in that city. Branch offices are maintained at Cincinnati, Chicago, and St. Louis.

Mr. James J. Hooker, and Mr. B. W. Putnam, of the original partnership, and later the president and first vice president, respectively, died a number of years ago, leaving the management of the business in the hands of one of its founders' sons, Mr. Kenneth R. Hooker, who is now president of the Company.

Since organization the Putnam-Hooker Co. have made cotton goods the most important factor of the business and they represent as selling agents some of the most successful mills in the South. Of late years there has been a great expansion in the trade in cotton goods and while formerly the sales were confined principally to dry goods houses, there has been a large demand from manufacturers of agricultural implements, clothing, rubber goods, duck garments, shoes, tents and awnings, in fact, some seventy-five different branches of trade as well as from dealers in various lines.

CHARLES IRA BIGNEY

In these days of efficiency in the construction of new plants or additions to present establishments which have become too small, the contractor occupies a prominent ing more than a stout heart and a wealth of ambition, Charles Ira Bigney, president and treasurer of the C. I. Bigney Construction Company of that city, has attained note-



CHARLES IRA BIGNEY

place in the textile field, and it is pleasant to tell the story of one who is not only a successful builder but has entered the textile manufacturing field as well. Coming to Providence, Rhode Island, approximately fourteen years ago, a country lad with noth-

worthy success. A Nova Scotian boy with the natural keenness of the Provinces he climbed the ladder of achievement.

Mr. Bigney may well look back upon the years of his youth, when without the usual time allotted to the growing boy for play,

he began to build a future that stands far ahead of those who were satisfied to take life as it came. Less than forty years of age, he is what might well be termed "a self-made man." Today he stands in the sunshine of success and the future surely holds nothing but greater success, as Mr. Bigney has surrounded himself with an organization of men who carry a portion of the greater responsibility which rests on his shoulders and aid in realizing his most ambitious plans.

The C. I. Bigney Construction Company of Providence stands for the best in modern construction methods. The company is the only construction concern in that city which handles the entire work from the time authority is given to build until the finished product is turned over to the The business is conducted on a strictly ten per cent basis, and is the only concern operating entirely in this manner in Providence.

Charles Ira Bigney was born in Millvale, N. S., November 14, 1881. That little town sits among the grandeur of the Nova Scotia hills and is one of the delightful places that abound in that section. He is the son of John Marshall Bigney, now deceased, and Olive E. Fisher, who still lives. His education, so far as books are concerned, was attained in the public school of Millvale. The school-room was crude, as all country schoolhouses are, nevertheless, from one grade to another he advanced, until he reached the age of thirteen years.

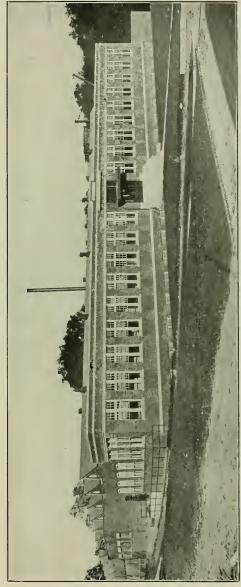
There was considerable to be done in those days on the farm and at this age he gave up his connection with the school and became the chief assistant to his father on the farm. There were long tedious hours in farm work. This, however, did not deter young Bigney and he applied himself with extraordinary effort. The farm prospered under his guidance, and when the lad reached the age of twenty-four years it was considered one of the leading stock farms of that section. Even while engaged in farming the boy found an opportunity to put his mind to other uses. At this early age his shrewdness in a trade was commented upon and later he sold farming implements in conjunction with his work on the farm. It was a common occurence after his day's work for him to ride his wheel 12 or 15 miles, make a sale of a farming implement, ride back home and deliver the goods by team from a town some ten miles away before the following morning. When he reached the age of 24 years young Bigney experienced a desire to reach out into the

world and his eyes rested on Providence as he looked at the map of his schoolboy days. Undoubtedly this was because his brother, Eden H. Bigney, had selected that city in which to engage in the general contracting

The day when that country boy from Nova Scotia arrived in Providence is one long to be remembered by him. With just the ordinary baggage he landed in one of the big cities of the East, and as he stood watching the hurrying crowds he realized that at last he had been favored by fortune and was in a real center of activity. Despite little or no knowledge of the contracting business, he expressed a desire to immediately begin work. A few days after his arrival he started as a laborer. After a time he apprenticed himself to the carpenter's trade and mastered this art. Previous to this he had done everything from digging a trench to wheeling a barrow and tired was the body and mind that sought its rest at night. For a period extending over two years his efforts in the construction line were directed towards laboring and carpentering. Then came a chance and he was put in charge of some heavy work. Under his direction the work was done in a satisfactory manner, a number of his ideas being entirely original and a new departure from the ordinary customs employed. From this time on he was entrusted with more important work and his first complete charge was during the erection of the brick building on Broad Street for the Baird-North Company, silversmiths. It was a two-story structure, 75 x 200 feet, and the builder was complimented when the completed building was turned over to the owners. During the next four years he supervised the construction of many big buildings in the City of Providence. Long hours held no terrors for him, and, as a matter of fact, he was happiest when "on the job," and when off the job he was continually devising methods whereby construction could be improved.

About this time the health of his brother began to fail. The latter's confidence in Ira, as he is better known, brought him into the office and he succeeded his brother as manager of construction with a share in the firm of E. H. Bigney & Co., with offices at 898 Westminster street, where the firm's headquarters are at the present time.

Eden H. Bigney left for the South for the benefit of his health and the entire business fell on the shoulders of the younger brother. lt was just such an opportunity as he had long wished for and from that moment the



Branch Village, R. I., Mill, Designed and Built by the C. I. Bigney Construction Company for the Andrews Mills Company, of Philadelphia

construction company entered upon a new era which has spelled nothing but success. For a period extending over three years he has conducted the business, accepting and putting through new contracts, attending to purchases and following the work in its

progress.

Charles Ira Bigney came into full ownership of the company when his brother sold out to him in May of 1913. At that time E. H. Bigney & Company was doing a business of \$100,000 a year, but the younger brother found himself with practically no money and \$10,000 worth of stock. It was a condition which would tend to dishearten many, but not "Ira" Bigney. His first act was to install an engineering and estimating department, and in so doing he was favored with the selection of men who have proven their worth. Mr. Bigney is never too busy to praise his different departments and always his contention has been that they are unequalled elsewhere.

The company went into the construction of mills, power houses, foundries, theatres and residences. The Empire Theatre in Fall River is the work of this company and compares with anything in the New England States for beauty. Early in its construction period the entrance of the United States into the war occurred. There was a hurry call for steel and the government cancelled all civilian contracts in order to fill its own needs. Undaunted by the many set-backs the work was pushed along, until in November, 1918, the magnificent playhouse was opened to the public. In March of the following year the theatre was sold to other interests and Mr. Bigney well told the story at a banquet of the employees when he said, "We built the Empire; we sold it; we made money." It was a short speech, but it contained a wealth of information.

In May of 1918 the C. l. Bigney Construction Company began the erection of a manufacturing plant at Branch Village, R. I., for the Andrews Mills Company of Philadelphia. The plant was entirely designed and engineered by the Bigney Corporation, and the structure, together with equipment, cost in the vicinity of \$600,000. When the plant began operations the character of the construction attracted the attention of mill

owners generally.

Some idea of the growth of the C. I. Bigney Construction may be gleaned from the fact that business has doubled and tripled in the last five years. The returns from the business have been large and Mr. Bigney might well be considered a man of more than ordinary wealth today. Those asso-

ciated with him have also enjoyed their share of this success with, we trust, many good years to come. There are many contracts on hand, including a four-story building on Harrison Street, two-story manufacturing building at Mapleville, R. l., two-story silk mill at Valley Falls, two silk mills at Central Falls, pipe shop and bending plant at the General Fire Extinguisher Company at Auburn, R. l., many miscellaneous structures throughout Rhode Island, a beautiful private residence in Elmhurst, and a number of mill houses and two-story dye-house at Esmond, R. l. Business for the year 1920 made a rapid growth.

made a rapid growth.

In the year 1918, Mr. Bigney enjoyed his first vacation. It took him through the South for a period of six weeks. In the years before he had felt that he never had time for a short respite, as the same ambitious spirit which characterized his boyhood days was carried into older life.

In the city of Providence at the time this was written there were four structures in process of construction by the firm; a twostory jewelry factory, a two-story auto service station on Elbow street, the one-story building 80x300 feet on Eddy street and the four-story office building for the General Fire Extinguisher Company and a bleachery at Westerly, R. I., to cost \$150,000. The work is being done entirely on a ten per cent commission basis, as are all the contracts taken by the company. One very pleasing fact to relate is that Mr. Bigney's reputation has become so secure, that the firm is frequently entrusted with contracts without the submission of definite figures, but is told to proceed and render an accounting on completion of the work.

Early in the year of 1919, Mr. Bigney came into possession of a mill at Wakefield, R. I., and today it is operating as a braid and shoestring manufactury with a value of \$155,000. Mr. Bigney is president and treasurer of the concern which is known as the Braid & Lace Company of Rhode Island. The machines installed number more than 600 and fancy hat bands are also manufactured. It is somewhat of a new venture for Mr. Bigney, but it has been a success to date. and is doing a large export business.

The story of Mr. Bigney's career is an unusual one. His life is one which might well be a model for others and it bears out the fact that persistency brings success. He is a member of the Standard Oil Golf Club, West Side Club, Turk's Head Club, Kewanis Club, Reciprocity Club, Chamber of Commerce and the Board of Trade, also of business men's clubs in other cities.

MILLS AND GIBB CORP.

The corporation of Mills & Gibb, Fourth avenue and Twenty-second street, New York, has acquired a deserved place in rics, laces, lace curtains, gloves, ribbons, and trimmings. Branch offices are situated in Philadelphia, Boston, Chicago, and San



Main Office of Mills & Gibb Corporation, New York City

the mercantile world. The firm are importers, manufacturers and converters, on a large scale, handling, among other articles, linens, handkerchiefs, wash and white fabrachiefs, wash and white fabrachiefs.

Francisco; abroad, in Nottingham, England; Plauen, Germany; Belfast, Ireland; and in Calais and Paris, France. George R. Fogarty is president.

JOHN A. STEVENS

Mr. John A. Stevens of Lowell, Mass., whose engraving accompanies this sketch, is engaged in the profession which will be of interest to the milling men in the textile industry who are striving after the best results in the construction and maintenance of the plants which are placing our textile manufacturing in the forefront in the strife for the world's business.



JOHN A. STEVENS

Mr. Stevens is an engineer whose specialty is power plants, be they steam, electric, or hydro-electric. He is in no sense a contractor, but a consulting engineer whose knowledge and analysis on design, construction and management has been obtained in that most practical of colleges—experience. He has never had to unlearn the technical teachings of impractical courses which often obstruct the early progress of the professional engineer.

The National Association of Cotton Manufacturers thought so well of Mr. Stevens' services rendered to that industry during the

year 1917 that it presented to him the Association Medal of 1918 for having contributed most for the advancement of the cotton industry through his paper "Evolution of the Steam Turbine in the Textile Industry."

Mr. Stevens was born in Galva, Ill., Sept. 16. 1868, and his schooling was obtained so far as books are concerned in the West. He graduated from the High School at Saginaw, Mich., and then entered the University of that state at Ann Arbor with the intention of taking a course at that great institution. After a year, however, the urge for the practical work of a shop overcame his desire for further study in college and he entered into an apprenticeship in a machine shop in Saginaw and graduated from the shop rather than from the University.

A year with the Pere Marquette Railroad as one of its tool-makers added further knowledge to his store. From railroad work to steamships was an easy transposition and here Mr. Stevens entered into one of the most interesting portions of his hard-working career and began again accumulating his experience as a steam engineer, since he had already acted as fireman on a dredge when a boy of only twelve years of age. He engaged as a marine engineer with the companies plying the Great Lakes and continued in this work until the desire for broader fields again mastered him. In 1893 he forsook the Lakes and went to New York and obtained a position with the International Navigation Company in their steamship service. Within three years after entering this Company's employ and after having made a number of voyages in its largest vessels and acting as first assistant engineer of the "St. Paul" he obtained an unlimited engineer's license for ocean steamships, this being the highest license issued in marine work.

Mr. Stevens at this time was but twentyseven years old and realizing that he had attained the summit in this particular line turned his attention to another and made his first entry into the textile field. He became chief engineer of the Merrimack Mfg. Co., of Lowell, Mass., and remained with this Company for thirteen years during which period he practically reconstructed its entire steam system at the Lowell plant and at the same time superintended the construction of the power departments in the Company's mills throughout the South. Again feeling that he had exhausted the resources in this particular line he resigned from the Merrimack Mfg. Company for the purpose of

opening an office as a consulting engineer. A few months of further study in Europe equipped him with a broad knowledge of

things in the power world.

For the last dozen years Mr. Stevens has been engaged in private practice and with his associates has to his credit some of the most remarkable power designs in the country. A recent issue of "Power", the engineering magazine, has this to say about Mr. Stevens' connection with the steam boiler codes: "He is probably best known to the public through his connection with the preparation of steam boiler standardization codes. He was a member of the original Massachusetts Board of Boiler Rules, representing the "boiler-using" interests. Stevens described the first meeting as taking place in a very small hot room in the State House at Boston on July 5, 1907. At this meeting Mr. Joseph H. McNeill, who was chairman, outlined the plan to formulate a standard for boiler design which should be first of all safe, and second commercial. Meetings were held weekly or oftener for practically three years. Suggestions, ideas and data were solicited and received from all known authorities, various pamphlets were issued and finally the board published the issue of the rules of August 5, 1909. This was the last issue by the original board and contained all necessary information for the manufacture or inspection of stationary steam boilers in Massachusetts at that time.

"In 1911 a committee was appointed by the American Society of Mechanical Engineers for the purpose of preparing a standard boiler code in a more complete manner than was possible with the Massachusetts State Board. Mr. Stevens was made chairman of this committee, which position he still holds. This work was carried on along lines similar to those followed in Massachusetts in taking counsel with all possible authorities who would be interested. A comprehensive code was issued in 1914, which has been adopted by seventeen states and ten cities."

Mr. Stevens experience on this particular committee has consumed much time and has resulted in his realizing the importance of research and invention, and again quoting from "Power": "He has created a trust fund with the American Society of Mechanical Engineers to be known as the John A. Stevens Trust Fund, amounting to \$24,000, the income of which is to be paid annually, after 1937, to the persons who have in any year invented or been responsible for the

invention of a noteworthy progress in engineering, having to do with the conservation of fuels in the generation of light, heat and power."

Mr. Stevens is also an inventor of note and has eight patents containing 113 claims on water tube boilers to his credit. He is also co-inventor of the Stevens-Pratt Boiler which is designed especially for use in cen-

tral station work.

In spite of the demands upon his services during the last three years, Mr. Stevens has found time to make a thorough study of the features of design and operation of a socalled "Super Power Station". This station was described and illustrated in detail in the May 25th, 1920, and June 1st, 1920, numbers of "Power". It was conceived in answer to an ever increasing demand for a central power station of a heretofore unknown size, so designed and co-ordinated as to embody all the most modern appliances for the production of electrical energy, which would be capable of producing electricity at a cost considerably lower than is done in our so-called large stations of today. It is thought that, in the not very distant future, this super-station will be considered in connection with the so-called "Super Power Survey", being conducted by the Department of the Interior, for the purpose of suggesting measures to reduce the economic waste in men, coal and money which results from the operation of a great many small and comparatively inefficient power plants.

Although a Westerner by birth, Mr. Stevens comes from real New England stock, being a direct descendant of John Alden. He is a member of the American Society of Mechanical Engineers (past vicepresident), the American Society of Heating and Ventilating Engineers, the American Society for Testing Materials, the Society of Naval Architects and Marine Engineers, the National Association of Cotton Manufacturers, the Lowell Chamber of Commerce, the Massachusetts Chamber of Commerce, Fall River Chamber of Commerce, and of the High School Building Commission of Lowell. He also holds membership in the following clubs: Old Colony of New York, Engineers' of Boston, Yorick of Lowell, Vesper Country Club of Tyngsboro, Mass., Scituate Yacht Club, and Lowell Humane Society.

Mr. Stevens' main office is at 8 Merrimack street, Lowell, Mass., and he maintains branches at Cleveland, Ohio, and Fall River, Mass.

WEST BOYLSTON MANUFACTURING CO.

Through the passage of an act of incorporation of the general court of Massachusetts, February 3, 1814, there came into existence the West Boylston Mfg. Company. Its purpose, as set forth in the charter, was the "manufacture of cotton and woolen cloths and fine wire." The original act of incorporation was amended June 14, 1823, and this Company, though not quite the oldest cotton mill in the United States, is, so far as known, the oldest in point of incorporation in the history of the American textile industry.

The growth of the plant in 107 years to a great group of mills and storehouses, covering thirty acres at Easthampton, Mass.,

pickers and one willow, thirty-two cards, eighteen inch, one drawing frame, three Taunton speeders, fourteen spinning frames of sixty-four spindles each, five mules, containing 1,328 spindles, two dressers, one warper, one doubler and fifty looms.

Operations continued with constantly increasing success at this location until 1900. That year a change was necessary because the Metropolitan Water Board had bought the mill site and water rights as part of the system for the water supply of Boston. A new location was soon found in the purchase of the Williston Mills at Easthampton and bu incess resumed in 1900.



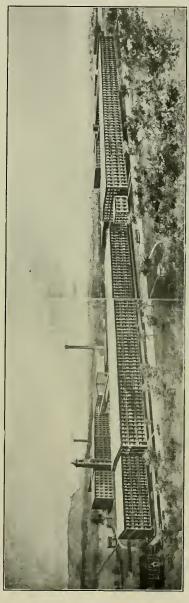
Employees' Dwelling Houses, West Boylston Manufacturing Company

from their first factory at White's Village, West Boylston, Worcester County—a small wooden building which if standing now among the later ones, would be almost like the proverbial needle in a haystack—would amaze the founders of this enterprise.

The original factory shared the fate of many such flimsy structures of those early days when the later safeguards against fire were unknown. The burning of the plant came as a heavy blow to the owners, but they rallied from it and built again on the same site in White's Village later known as Oakdale. This was about 1839. The mechanical equipment of the new buildings consisted of two

At that time there was only one comparatively small mill, but this was completely remodeled and equipped with new machinery. It was the nucleus of the present large plant at Easthampton with its 137,500 spindles, 1,200 looms, heavy and light, and mass of specialty machinery, the whole requiring the services of a force of 2,700 workers. Besides the buildings shown on another page and designated "West Boylston Mfg. Company, Easthampton, Massachusetts," there is a five-story mill, 640x120 feet, and several additional brick store houses.

Throughout its entire long history the Company has manufactured specialty lines.



West Boylston Manufacturing Company, Easthamnton, Massachusetts

Its products, sold through J. H. Lane & Company, of 334 Fourth avenue, New York City, are fabrics and cords for automobile and bicycle tires and specialty cloths for the rubber and other industries. With facilities

James W. Lane, president; F. Coit Johnson, vice-president; John Skinner, treasurer; and G. Arthur Cook, assistant treasurer and secretary; and to the general superintendent, Morris L. Comey, as well.



Recreation Building, West Foylston Manufacturing Company

amply adequate for its large business and a reputation for fair dealing extending back further than those in the textile industry today can remember, the Company is one of those substantial institutions of American The officers of the West Boylston Mfg. Co. are firm believers in the cultivation of the friendship of industry's toilers and have adopted various practical means of fostering good will among their 2,700 people, one



West Boylston Manufacturing Company in 1839

business that hold such a distinguished place in the country's march of progress. It has earned this place and honor through the untiring efforts of men whose example is a source of inspiration to the present officers: being the building of houses. These are directly opposite the mill buildings and shown on another page. A recreation building for employees which was developed during a recent year, is also shown.

NEUSS, HESSLEIN & CO.

An enormous business is no exaggeration in describing Neuss, Hesslein & Company's operations. Textiles are merely a single item in a total that includes all the major needs of commerce. The firm was established in 1865 by Edward Neuss and S. A. Hesslein, who continued until 1893, when the latter retired, succeeded by his son, E. J. Hesslein. Edward Neuss left the firm in 1895 when John Staudt, for fifteen years in the firm's employ, and E. O. Beyer, became members. Mr. E. J. Hesslein and these gentlemen have since been the official heads of the business, incorporated in 1918 to perpetuate this well established firm name.

merchandise as well as exporters of raw products in all Latin American and far eastern countries, the firm received consignments of them and eventually became large buyers as well, of raw products from these countries. Thus a large import sales department was built up by the firm which was able, despite the war, to bring in shipments of raw material essential to the manufacture of commodities formerly imported. The domestic department, growing out of the export dry goods department supplied canvas, the trade in which was formerly monopolized by foreign manufacturers. When the European supply was cut off, the



Interior View of the Offices of Neuss, Hesslein & Company

In 1865 a modest beginning was made with the importation of hair nets. Starting as importers, the firm also became exporters in 1872, gradually spreading their field by establishing branch offices and agencies throughout Latin America and the Far East. In all of these markets "Nehesco Prints," including such standard prints as "Usela," "Aurora," and "Ni-Grande," "Usela," "Aurora," and "Niagara" have become the first selection of experienced buyers. The dry goods sales department represents as sole export agent some of the most prominent mills in the United States. Through its many and excellent connections representing the largest importers of dry goods and other American company came forward with a "Nehesco Canvas," a strictly American fabric brought cut by experts.

Neuss, Hesslein & Co. call the sample department the "corner stone" of their cotton piece goods business. No expense is spared to insure as nearly perfect a distribution of samples as possible. Close attention is given to safe and economic packing of all merchandise. Baling is done by an electric hydraulic press and no expense is spared to turn out perfect bales. The Company continues propaganda to win the commercial friendship of the merchants of all nationalities and their efforts have produced excellent results.

RIDLEY WATTS & CO.

Even the most casual inquirer into the relative status of the firms that constitute the main strength of the textile industry from the administrative side would soon learn of the prominence held by Ridley Watts & Company, occupying a position among the restricted number of foremost houses whose influence is of national and international scope. They have not as old traditions as some of their fellow merchants, but the individual experience of the firm's members has been long and comprehensive and within recent years they have forged ahead, winning a substantial brand of success

The energy and enterprise of the members, individually and collectively, of Ridley Watts & Company has indeed been the motivating power behind their attainments. Ridley Watts embodies the progressive spirit of the new era being entered upon by the textile industry. His unceasing activity and accurate judgment of business problems has had effect not alone in the affairs of the firm but in the larger interests of the mercantile fraternity. He was one of those who spared no effort to insure full representation of the New York textile district in the Liberty Loans and war emergency measures. Horace C. Stebbins, Mr. Watt's partner, who retired August 1st, 1920, also stands high in the estimation of the trade. He saw active military service during the crisis as a colonel on the General Staff. C. Whitney Dall, another member of the firm, commanded a battalion of the 305th Infantry of the 77th Division. Charles H. Murphy, Arthur R. Johnson, and Benjamin Dennis, take each an active part in the direction of the business. Donald B. Stewart is the partner in charge of the export department.

Watts, Stebbins & Company succeeded Grinnell Willis & Company in May, 1916, upon which date the latter firm expired by limitation. Grinnell Willis was a prominent New York merchant of his day and had a record of more than a quarter of a century in the dry goods commission field. Building from small beginnings, he established a solid reputation for the house that bore his name. In the years prior to his retirement

Mr. Watts, Mr. Stebbins and Mr. Murphy were his partners, and the other members of the present firm were also long associated with the old organizations.

In 1920, after the retirement of Colonel Stebbins from the firm, Ridley Watts & Company became the successors of Watts, Stebbins & Company. The activities of the present company are conducted along broad lines that embrace export and domestic markets and supply to those markets a diversity of fabrics exceptional even for a large dry goods commission house. Wide sheetings, muslins, cambrics, brown sheetings, lingerie cloths, long cloths, nainsooks, lawns, gauzes, and suitings, are some of the products distributed through Ridley Watts & Company, which are the selling agents for a number of mills whose characteristics - traditional quality or, as in the case of lately established plants, some well-known superiority-have made them known far and wide.

The Wamsutta Mills, New Bedford's first cotton mills, founded more than seventy-five years ago by the discerning Joseph Grinnell and his partners, can be called the most famous mill property on the Ridley Watts & Company list. Its long history is described elsewhere in this volume. It is today a stronger producing unit than ever before; a \$3,000,000 corporation headed by Oliver Prescott, president; C. F. Broughton, treasurer; and Geo. E. Raycroft, assistant treas-The several mill buildings contain 239,000 spindles and 4300 looms. plant remains one of the three or four largest in New Bedford, employing 3200 operatives and manufacturing bleached and brown sheetings, lawns, sateens, poplins, and repps, as well as the well known Wamsutta sheets and pillow cases.

The Grosvenor-Dale Company of Providence, R. I., another New England mill scarcely needing detailed description so far has its fame spread, distributes the well-known Masonvill muslin and cambric through Ridley Watts & Company. The total production of this mill includes shirtings, sateens, fancies, jacquards, and twills. The plant, situated at North Grosvenor Dale, Conn., is a manufactory of splendid dimen-

sions, typical of the best equipped and managed large mills in the country, employing twelve hundred workers, and holding 3798 narrow looms and 124,000 ring spindles. William Grosvenor is president; A. H. Tillinghast, vice-president; and A. W. Dimick, treasurer.

The southern mills represented by Ridley Watts & Company deserve separate mention because of distinguishing features. Colonel D. K. Norris was a textile pioneer in South Carolina. He established the Norris Cotton Mills Company (incorporated 1895) at Cateechee, near Greenville, and in a unique location, on the river edge in a wooded ravine where excellent water power was discovered. On adjacent heights a prosperous mill village grew to replace the forest. Colonel Norris was succeeded by T. M. Norris, president and treasurer, who continues the manufacture of wide print cloths. The company is capitalized at \$312,500 and includes in its equipment 452 wide looms and 19,968 spindles.

The Scottdale Mills, of Scottdale, Ga, incorporated in 1900 at \$500,000, was one of the investments of the late George W. Scott who was a pioneer in the fertilizer industry of the Southeast. The products are the popular Scottdale shrunks and suitings and forty-inch brown sheetings for the converting trade. These are produced with 320 broad looms and 11,068 spindles. J. J. Scott, the president, who succeeded his father, the late Geo. B. Scott, takes an unusual pride in the product of this mill, giving much of his personal attention to the details

of manufacture.

The Georgia Duck and Cordage Mill of Scottdale, of which the late Mr. G. B. Scott was president and Mr. J. J. Scott, his son, treasurer, originally made twine but was later reorganized to run on belting duck of various widths. This mill set an exceptionally high mark of efficiency in the rapid delivery of its product to the government during the war period.

The Victor-Monaghan Mills comprise an extensive group of plants situated at Arlington, Greenville, Greers, Jonesville, Seneca, Union and Walhalla. South Carolina. The incorporation of \$5,943,400 occurred in

1915 and the main offices were placed in Greenville. Products corresponding in variety to the number of plants total a great volume—yarns, fancy shirtings, quilts, pajama checks, wide and narrow sheetings, and print cloths. Under the leadership of M. C. Branch, W. E. Beattie, and T. M. Marchant, these mills have developed remarkable welfare work. Community houses, swimming pools, and other recreative facilities are provided. A mill newspaper, "The Shuttle," regularly records events at the various centers.

The specialties of the Fountain Inn Manufacturing Company are print cloths, especially narrow cloth for the printing and bag trades. While the mill is located at Fountain Inn, S. C., its offices are in Greenville as it is one of the properties owned by the Woodside Cotton Mills Company of that place. The Fountain Inn Company was incorporated in 1898 and has a capital stock of \$400,000 preferred and \$150,000 common. Of equipment there are 458 looms and 16,830 spindles, operated by two hundred employees. J. D. Woodside is president; J. T. Woodside, treasurer; and E. F. Woodside, secretary.

One of the newest and most up-to-date plants represented by the company is that of the Blue Buckle Cotton Mills, Incorporated, Rock Hill, South Carolina, of which Mr. Alex. Long is president. This plant contains new machinery throughout, and manufactures a high grade of indigo denim.

The Rhodhiss Mills Company at Rhodhiss, North Carolina, succeeded the E. A. Smith Manufacturing Company and the Rhodhiss Manufacturing Company manufacturing narrow and wide drills, as well as heavy 40-inch sheetings. The two plants are situated at one of the developments of the Southern Power Company on the Catawba River, and enjoy unusual facilities in the matter of power. Mr. R. C. Moore, president, was connected for many years with the old organization. The new capitalization is \$1,000,000. The plant has 30,000 spindles.

The directing of Ridley Watts & Company's interests is done from 44-46 Leonard street, New York. Their establishment is one of the busiest spots in the down-town

district.

WEIDMANN SILK DYEING CO.

The Weidmann Silk Dyeing Company of Paterson, New Jersey, practically the largest plant in the world of its kind, was established in 1872 by Jacob Weidmann and was located between Paterson and Ellison streets sylvania, where 200 employees are engaged. This branch is now known as the "Pennsylvania Annex." The capital required to conduct this great business is \$5,000,000. The products consist entirely of silk skein



Plant of Weidmann Silk Dyeing Company, Paterson, New Jersey

and the Erie Railroad. The Company was incorporated in New Jersey in 1882, and in 1887 moved to their present location on Fifth avenue, Paterson, where their present buildings cover more than fifteen acres of ground and give employment to 1600 people. Altogether the Company owns and controls over 100 acres of ground in Pater-

dyeing with a working capacity of 20,000 pounds a day. They dye blacks and all the other colors known to this industry.

The product is consumed in the United States, from coast to coast. The equipment consists of the very latest word in silk-dyeing machinery of both American and European manufacture.



The Silk Dyeing Establishment of Jacob Weidmann as it Appeared in 1880, Located at Ellison and Paterson Streets, Paterson, New Jersey

son and in the borough of Hawthorne, just across the Passaic river.

In addition to this immense plant the Company in 1919 took over the Lehigh Silk Dyeing Company at Allentown, PennThe officers of the Company are: Edmond Gillet, president; August J. Hunziker, vice-president; Emil S. Halter, vice-president; Fred S. Cowperthwait, treasurer; and John W. Griggs, secretary.

PROCTOR & SCHWARTZ, INC.

FORMERLY THE PHILADELPHIA TEXTILE MACHINERY CO.

Drying is one of the very important operations in the textile mill. The invention and development of efficient and dependable machinery for drying has had a far-reaching benefit in the industry, influencing the quality of product, the rate of production and the cost of operation.

Of the drying machines on the market, "Proctor" Dryers are in the widest use. These machines are built, it is stated by the company, by the oldest and largest manufacturers of drying machinery in the world —Proctor & Schwartz, Inc., formerly The Philadelphia Textile Machinery Company, Seventh Street and Tabor Road, Philadelphia. Pa.

The "Proctor" organization of engineers consists of specialists in the theory and practice of drying. For nearly forty years this organization has devoted all its efforts to the investigation, development and building

of drying machinery only.

This long specialized experience has given these engineers the broadest knowledge of drying problems in all branches of the textile industry. As the result, "Proctor" Dryers have been evolved in standard models for the efficient and economical drying of textile raw stocks, yarns and fabrics of every description.

Furthermore, the broader experience in their field enables the makers of "Proctor" Dryers to create machines of new design as any exceptional individual need of the man-

ufacturer is presented to them.

Proctor & Schwartz, Inc., formerly The Philadelphia Textile Machinery Co., was founded in 1883 by J. K. Proctor, who, prior to his recent death, was chairman of the board of directors. The present officers are: C. W. Schwartz, Jr., president; W. M. Schwartz, first vice-president; E. B. Ayres, second vice-president; F. Kershaw, secretary and treasurer; and H. T. Hershey, superintendent. Capitalized at \$2,500,000 and possessing, as stated before, the largest plants in the world devoted exclusively to the manufacture of drying machinery, they have succeeded in distributing "Proctor" Dryers in textile mills throughout the world. Proctor & Schwartz, Inc., have branch offices in Chicago, Providence, New York, Charlotte, N. C., and a Canadian agency in Hamilton, Ontario.

W. & J. SLOANE

Looking upon that wonderful institution, the W. & J. Sloane store at Forty-seventh street and Fifth avenue, New York City, it must be acknowledged that when on March 2, 1843, William Sloane opened his doors at 245 Broadway the occasion was an event. For it was from this beginning, in a store only 20x80 feet and rented at \$3,000 a year, that there grew in seven steps the vast carpet business today conducted by Mr. Sloane's sons, grandsons and their associates.



WILLIAM SLOANE Founder of the Carpet House of W. & J. Sloane (Picture is from an old print on wax paper)

Six times has the house of Sloane set up larger quarters, until now this progressive firm is established in an eight-story building impressive in its simple dignity and a fit abiding place for the treasures of the loom to be found within its four walls.

When the first William Sloane in America was looking through the years to come, he knew deep down in his heart, that though in 1843 only about five per cent of the carpets sold in the United States were made in the United States, American initiative would eventually produce sufficient floor covering to meet the domestic demand.

William Sloane was right, and today all but an infinitesmal fraction of the carpets sold by W. & J. Sloane are of American manufacture.

As showing the turn of the tide, it is interesting to note that in 1893 when mills had difficulty in disposing of their full production at home, the Sloane Company opened an office in London and for three years following exported to Great Britain carpets made in the United States, being the only American house that has ever exported

carpets in quantity.
William Sloane, the astute founder of the Sloane business, was born in Kilmarnock, Scotland, in 1810. He learned the manufacture of carpets in Edinburgh, under Richard Whytock, famous inventor of the tapestry loom. Fortified with the knowledge gained under such auspicious circumstances, Mr. Sloane, in 1834, having come to New York, entered the employ of Thompson & Co., then selling agents of the Hartford Carpet Company, of Thompsonville, Connecticut. Inherently acquisitive, in so far as information was concerned. Mr. Sloane kept in close touch with the inventors of his time and industry. these, besides Richard Whytock, were E. B. Bigelow, inventor of the power loom, and Alexander Smith, who introduced the Axminster loom. Mr. Sloane was an intimate friend of Mr. Bigelow and was a director of the Bigelow Carpet Company. His association with Mr. Smith was quite as close, and the founder of the manufacturing plant at Yonkers, now owned by the Alexander Smith & Sons Carpet Company, often consulted with him on matters of importance. Thus from early days the house of W. & J. Sloane has been identified with the manufacture of carpets in America.

Starting with a capital of \$20,000 and four employees, William Sloane soon was on the high road to success. In 1852, William Sloane's brother, John Sloane, was admitted to partnership and the firm became W. & J. Sloane. John Sloane retired eight years later. In 1855, the business, now fast expanding, was removed to 501 Broadway, where it continued for six years.

ln 1856, William Sloane's eldest son, John, was taken in as a partner and began to prepare himself for the responsibilities which he would one day assume as head of the house, though many more years of usefulness were in store for the founder.

Within the ensuing ten years the firm moved twice, first to 591 Broadway and then, in 1866, to 649-655 Broadway, where land had been purchased and a store erected. In 1870 there was added to this property an L fronting on Mercer street and connecting with the main building.

William Sloane died in May, 1879, widely mourned. During his life he had taken a live interest in civic affairs, philanthropies, charities and his church, the Fifth Avenue Presbyterian, of which he was an elder. His public bequests were generous and wisely applied. He never joined a club. Art was his hobby, and he was one of the first patrons of the Metropolitan Museum.

With the passing of this veteran of the carpet business in America his four sons took their places at the helm, John becomof his own business, he was a director of the Northern Pacific Railway and vice-president of the New York City Chamber of Commerce. He was an ardent Republican and a warm personal friend of President Mc-Kinley. He had influential connections abroad as well as at home and crossed the ocean 100 times, mostly on business. The



Building at 245 Broadway, New York City, in which William Sloane commenced Business

ing the senior partner, and upon the incorporation of the new company in 1891 its president.

In 1882, the growth of the retail, as well as the wholesale departments, and the increased importations of Oriental rugs had made larger show rooms imperative, and a building was erected at Nineteenth street and Broadway, with an L on Eighteenth street. This building remained the home of the firm until April, 1912.

John Sloane remained president of W. & J. Sloane until his death in 1905. Outside honorary degree of M. A. was conferred upon him by Yale University in 1889.

The 1912 move of W. & J. Sloane was to the present location. It had been the site of the Windsor Hotel, which was destroyed by fire. Taking a business so "far north" was regarded by some as a step not without possibilities of disaster; but the Sloane brothers confidently took possession of their commodious new home, especially designed and constructed for a rapidly growing business. That their judgment in regard to location was sound and practical is evident from the rapid development of this

part of New York City, considered the finest retail section. But the clinching argument is the ever increasing volume of business.

Exclamatory adjectives do scant justice in describing the Sloane palace beautiful. Each floor is a revelation, and all radiate the essence of that good taste and the refinements expected in a cultured private home.

highly trained men and are made to feel at home from the moment they step through the door until they depart. Sloane Courtesy has made as many friends as Sloane goods.

What is true of W. & J. Sloane in New York is true of the Sloane branches in other cities. In San Francisco a house was established by Mr. William Sloane in 1875. Here

Page from First Ledger used by Founder of W. & J. Sloane, who kept His Own Books

A tour through the store is not complete without a visit to the furniture and decorating division. This is a development of the upholstery department, established in 1886. With a large staff of designers and shops of their own, W. & J. Sloane carry out any scheme for the decoration and furnishing of residences, clubs and other buildings.

Every last detail of this great establishment is in harmonious accord. Customers receive the most painstaking attention from

the Company has another eight-story building. This was erected after removal to temporary quarters when the house was destroyed in the earthquake of April, 1906. The firm occupied the new building in March, 1911. There is also a Sloane retail branch in Washington, D. C., at 1508 H street, N. W., and wholesale offices in Boston, Philadelphia, Chicago, St. Louis, Kansas City, Denver, Dallas, Los Angeles, San Francisco and Portland.

The business which William Sloane founded in 1843 with a working force numbering only four has grown to the point where there are 1,000 names on the payroll

Besides the stores in this country the firm controls a large factory in India, where hand-made rugs are produced with the perfection of detail and coloring characteristic of Oriental art. W. & J. Sloane are also important factors in the matting trade in Japan and China. Their connection with the most important Scotch, English and French manufacturers, made during the past half century, remains a valuable adjunct.

As selling agents for many mills, including the Nairn Linoleum Company, of

broken record of business dealings with one bank—the Bank of the Manhattan Co., founded in 1799 by Aaron Burr.

Among the partners who have contributed to the success of the house are the sons of the founder: John Sloane, admitted to partnership in 1856; Douglas Sloane, in 1858; William Douglas Sloane, in 1866; Henry Thompson Sloane and Thomas Chalmers Sloane, in 1873. Walter W. Law, of Briarcliff Manor, N. Y., was a conspicuous member of the firm in the management of its wholesale interests and for several years vice-president. He became a partner in 1866 and retired from active business in 1901 in order to give his name and energy



Present Handsome House of W. & J. Sloane at Forty-seventh Street and Fifth Avenue, New York City

Kearny, N. J.; Mohawk Carpet Mills, Inc., of Amsterdam, N. Y.; C. H. Masland & Sons of Philadelphia and Carlisle, Pa.; and the Willow Grass Rug Company of Green Bay, Wis., W. & J. Sloane exercise no small influence upon the manufacture of floor coverings in this country.

One fixed policy of W. & J. Sloane is loyalty to tried and true employees and coperating businesses. Four employees have been with them for fifty years and more, and nine for forty years and over, including two women. They have for fifty years had continuous business relations with one Chinese matting house, and no contract ever existed between them. For seventy-nine years the house of Sloane had had an un-

to the development of Briarcliff, resigning as director in 1920.

The present officers are: President, William Sloane; vice-president, George McNeir; treasurer, Henry T. Sloane; secretary, John Sloane. The other directors are Nelson S. Clark, William Sloane Coffin, and George H. Stevenson, of New York; and George Douglas Cooper, William M. Stevenson and F. O. Cooke, of San Francisco.

Four of the present directors of W. & J. Sloane graduated from Yale. Thomas C. Sloane was a member of the Yale Corporation when he died. The Sloane family's gifts to Yale have been well over \$1,000,000. Their gifts to the development of the carpet industry have been incalculable.

THE VISCOSE CO.

While viscose yarn, more commonly known as artificial or fibre silk, is the most



Partial View of Main Factory of Viscose Company, Marcus Hook, Pa.

recent commercial development of textile yarns, the rapid growth of this industry, particularly in the United States, has not been surpassed by any other textile fibre in use to-day.

Viscose yarn might be said to be the last of numerous efforts and experiments conducted by scientists for the last century to evolve a synthetic process for producing silk to equal the results of the silk worm. The work of the first half century was apparently fruitless as far as any commercial results show, and the final outcome as typi-



Employees' Dwellings, Viscose Company

fied by viscose yarn of to-day is not a substitute or competitor of natural silk, but a product which has nearly all the principal properties and features of silk and surpasses it in lustre and brilliancy.

The fact that it can be produced more cheaply than silk, has enabled it to fill a long felt requirement in the textile world for a material cheaper in price than silk and yet more lustrous in appearance than any form of wool or cotton. This it not only has done, but in addition has opened up new features in textiles heretofore not developed.

This process is the outcome of intensive effort for the past thirty-five years to improve an artificial silk first exhibited by Count de Chardonnet at the Paris Exposition in 1889, which was the result of a patent granted to him in 1884. The beginning did not cause much enthusiasm, for while the material had somewhat the appearance of natural silk, it was manufactured from



Mill of Viscose Company at Roanoke, Virginia

nitro-cellulose or gun cotton and consequently was very inflammable; this greatly limited its application. In 1890, de Chardonnet modified his process somewhat, and made his product more stable; but not sufficient to greatly extend its uses outside of braids, dress trimmings and goods of that nature. In spite of its more or less limited use, it proved a very successful venture financially until a cheaper process was dis-covered. The methods of de Chardonnet as well as all subsequent processes are based on forcing a solution of cellulose through minute round apertures so as to form continuous filaments, which, grouped together in numbers determined, form the desired thread. De Chardonnet used cotton as a base, which was dissolved in nitric and sulphyric acid forming the required solution.

In 1900, Bronnert patented another method of dissolving the cotton or cellulose,

known as the cupro-ammonia process, and which possessed advantages over the old method in that it was more stable and less dangerous to manipulate; further, its cost of manufacture was less. One of its disadvantages, however, was that it would not dye uniformly, and this limited its use to materials where this defect was not vital.

The viscose process of producing a solution of cellulose was discovered by three Englishmen, Cross, Beavan and Beadle, in 1892 and was quite a radical departure from that of de Chardonnet or Bronnert, in that Cross, Beavan and Beadle used wood pulp instead of cotton as a base, dissolving it in a solution with caustic soda and disulphide of carbon. This was the most economical of the three methods to use, and when finally perfected, was capable of producing a yarn having none of the serious defects of the others. The solution produced in this way is a thick heavy viscous fluid resembling molasses and the originators gave it the trade name of "Viscose," which name was later applied to the yarn made from it.

It was about eight years after the discovery of the "Viscose" solution before attempts were finally made to apply it in a commercial way to the manufacture of threads and filaments. In about the year 1900, experimental plants were established in England, France and Germany to perfect and carry out the process along commercial lines. England was the country to first succeed in the largest way. This was due to the efforts of Samuel Courtauld & Co., who had taken over the process for that country.

In the United States, a large amount of experimental work was done, at first by The General Artificial Silk Company, but its efforts were not successful in producing a yarn required by this market. This Com-pany was taken over by The Genasco Silk Works which continued the work started by the former Company and produced a marketable yarn, but only in small quantities. It was not until 1910 and 1911 that a plant was erected in this country solely for the production of this material, although over \$1,500,000 had been spent up to this time in the United States in experimental work in order to make this possible. This plant was put in operation by the American Viscose Company, now known as The Viscose Company, and is the only one in this country

to-day manufacturing the so-called artifi-

cial silk in a commercial way.

The initial plant of The Viscose Company was constructed at Marcus Hook, Pennsylvania, for a production of about a million pounds a year. This was further augmented by the construction of a plant at Roanoke, Virginia, so that at present there is available in this country, machinery and equipment for an output of twenty-two million pounds per year. Due to the world war, and the necessity of the Government for the material and labor needed in this process, the above figure has never been reached. and the total production is at present 16,-000,000 pounds per year. At Marcus Hook, Pennsylvania, the Company has built for its employees, a model industrial village of about four hundred houses; a recreation building having dining rooms and assembly hall, a dispensary hospital, swimming pool and pleasure grounds, resulting in the organization of foot-ball, tennis, theatrical clubs and a band.

Until the erection of the plant of The Viscose Company in this country, the bulk of the consumption of artificial silk was for braids, millinery and dress trimmings, but since that time, due to the superior product produced from Viscose, and also to the aid and better service a domestic manufacturer is able to give at home, its uses have extended to lines of manufactured textiles not attempted before this time.

In the weaving trades, silk and cotton mixtures for dresses, it has found a large usage for decorative effects both in warp, weft, and tapestry. In plushes and imitation furs, it has become one of the staples. Knit goods, particularly sweaters for use as a dress article, owe much of their popularity for the past few years to this new fibre. In the year 1917, approximately fifty million pairs of hose and socks were produced which were made wholly or in part of this yarn. Other lines of textiles in which it is used are underwear, knitted dresses, gloves, caps, embroidery and woolen goods.

The plants producing Viscose yarn in this country have land and facilities for further enlargement, and from their rapid development since 1911, it has seemed to be the policy of The Viscose Company to make every effort to keep abreast of the demands of the domestic manufacturer.

287

E. M. TOWNSEND & CO.

E. M. Townsend & Company has stood the test of time. It is one of the pioneer commission houses of New York and enjoys the distinction of having been in business since 1854 under the name of Townsend. E. M. Townsend, Sr., the founder, carried Townsend, Jr., and Alexander M. Stewart are the original members now active. Howard R. Townsend was admitted in 1918. The firm are the selling agents for the Lawrence Manufacturing Company, of Lowell, Mass., and the Sulloway Mills, of Franklin,



E. M. TOWNSEND (deceased)

forward the business until 1904, the year of his death. Henry C. Yale, deceased in 1897, was associated with him for many years. Another associate of long standing, J. C. Van de Water, died in 1911.

The firm, as at present constituted, is a partnership and dates from 1901. E. M.

New Hampshire. They also market the product of other knitting mills and manufactories of hosiery and underwear. They are known throughout the trade for high merchandising standards and bear a reputation earned by over half a century of service.

MANTON B. METCALF

The business of which Manton B. Metcalf is the head is known as Metcalf Brothers & Company. Associated with Manton B. Metcalf are his two brothers, Stephen O. Metcalf, and Jesse H. Metcalf. They are especially the distributors of the

land, R. l., and the Mohegan Mills, of Nasonville, R. l., making fine worsteds. The first mentioned mill was the original enterprise of the father of the present members, the late Jesse Metcalf, Sr. The sons carrying on the traditions of the founder, have



MANTON B. METCALF

products of several important mills—the Wanskuck Company of Providence, R. I., making worsted goods for men's wear, Auburn Woolen Co., of Auburn, N.Y., manufacturing a fine grade of woolens, also they are distributors for the Geneva Mills, Providence, R. I., making overcoatings and wool suitings; the Oakland Worsted Co., Oak-

given the family name a reputation for quality and reliability in the woolen market. Manton B. Metcalf's career in the textile business dates back to 1881 and to Swift, Sackett & Company. Today he acts as vice-president of two mills besides fulfilling the chief executive duties of the firm at 45 East Seventeenth street. New York.

H. R. MALLINSON & CO.

There has been and always will be a quality of allurement in silks not shared by the less aristocratic cottons and wools. They affect the sensibilities of sight and touch with an indefinable appeal of beauty and refinement that the humbler fabrics cannot rival. H. R. Mallinson & Company, Inc., is more than a "silk house"; it is the source of Mallinson silks. Therein lies a distinction. Until recent times silks made in America were merely silks, one of the staple lines of merchandise—produced in more or less standardized form, quantity rather than quality being the aim, and consequently comparative cheapness and indifferent artistry the result. Manufacturers found reasons aplenty for not daring to challenge the supremacy of the French, and the lovers of silks went unquestioningly to the French market whenever fine exactions were to be met. There, indeed, they did find texture, color, and design of undoubted loveliness, while the home products were in a measure justifiably relegated to second place.

But along came one who would not recognize the existing status as permanent. Hiram R. Mallinson, born in 1871 at Utica, New York, began in his early years to acquire the remarkable knowledge of silks which has been a strong element in his successful administration of the industry he Hs was a salesman, then a sales manager, and finally the owner of his own business which he has raised to a rank of international fame. How was such an achievement won in face of the perennial host of doubting Thomases?

In the first place there is the personality of the man-a dreamer with the power of action, creative ability moved by strength of convictions, the will to dare and be different, the prophetic vision of the innovator.

Secondly, he acted upon the belief that it was not only possible but economically practicable to weave on American looms

silks as artful, as perfect in quality, and as distinctive in texture as any produced in Europe; he instilled this idea into the minds of his weavers, devising ingenious systems at the mills to promote its attainment; he made quality the goal of all efforts, even at the sacrifice of quantity.

The third step in the conquest was simple but unique. The greatest campaign of education ever planned by a silk manufacturer was instituted and carried through over a period of several years with cumulative force. It would have done credit to the best of commercial enterprises, but in the domain of silk its consequences have been beyond measure a stimulus to universal appreciation. Individuality, character, definite standards of value were vividly impressed upon the minds of the public, teaching them that the broad, descriptive term, silk, was divisible into many fine parts. However, they had to be weaned away from the fetich of the European stamp and taught the truth, now conceded by authorities on both sides of the Atlantic, that American made silks are the equal, and in some cases the superior, of any woven in France.

Thousands of dollars were spent in educational propaganda to awaken women to the fact that silk of quality is neither an extravagance nor a luxury. Mallinson was told that American women would never pay the price for such silks when they learned of their American origin. He went ahead and

proved the contrary.

The war intervened and the looms of France were stilled, but instead of yielding to the depressions of those black years, Mallinson redoubled the vigor of his mes-The House of Mallinson was fully prepared to replace the suddenly arrested importations from France. Their advertising reached millions of women through the fashion magazines, household periodicals, newspapers and other advertising mediums.



H. R. MALLINSON

It has applied the suggestive title Pussy Willow to a certain silk and made it as well known as the little, velvety harbinger of spring whose "feel" it so well expresses in its silky way. In like manner it is making the names of the other Mallinson Silks familiar to the discriminating taste of a newly educated public. The feminine part of that public have come to understand that it costs just as much to fashion a gown from a cheap silk as it does from one of guaranteed quality; that authentic anticipation of styles, genuine artistic merit, novelty in weave and texture, the unusual in design and in color harmonies—all these are alone the characteristics of trademarked silks, particularly the beautiful Mallinson fabrics.

Originality in motif combined with exquisite color tones, the best of color printing, and a certain "news" value, have attracted the eyes of women all over the world to the printed Pussy Willows and Indestructible Voiles. No designs emanating from France ever displayed more imagination, more fidelity to a fine conception, than the La Victoire series which the House of Mallinson dedicated to the nation from which has come so much of inspiration. It was a Pussy Willow printed in the picturesque Nenete and Rintintin design that lined the fur coat of Mrs. Woodrow Wilson when she accompanied the President upon his peace mission.

To carry out his ideals Mallinson has gathered around him a staff of experts. He has in E. Irving Hanson, his partner, a man of rare good judgment and strong personality who is besides an authority on the art of designing. Mr. Hanson has been exceedingly active and efficient in developing the latent talent which came to light when American resources were called upon to supply a silk market deprived of French creations. The impetus given to fabric designing in this country and the surprising fund of ideas uncovered is a romance in itself.

As before indicated, the House of Mallinson conducts a business of international scope. Meeting demands apparent even before the close of the war, branches were established in Paris and London and representatives sent throughout South America. These branches are proving that the name of Mallinson attached to a silk is today, even in the heart of a silk-producing France, as potent as the name Rodier was formerly to the women of America. Mallinson's silks are constantly being ordered and shipped to France, England, South America, Australia—wherever civilized society has progressed to the wearing of silks.

For the future the House of Mallinson has planned comprehensively on a broad, constructive and creative scale. New mills, fresh achievements in silk weaving, more wide-spread advertising, are part of a programme which always, as in the past, shall aim for the highest attainable degree of qual-The main offices and exhibition rooms at 299 Fifth avenue, New York, are a center for buyers of silk. From every center for buyers of silk. From every quarter of the country and abroad they make annual and semi-annual pilgrimages to select the multi-colored raiment that is the product of Mallinson designers and weavers. In the haunts of metropolitan society, in the most richly costumed productions at the Broadway theatres, at the opera, both before and behind the footlights, each season's artistic gowns usually have as the foundation of their beauty a Mallinson silk. Yet Mallinson silks are not an exclusive luxury of the ultra-fashionable or the very wealthy. In spite of the talent employed in their design, the high value of the raw material, the extreme care used in their manufacture, a wisely and economically ordered plan of production places them within reach of multitudes who never before could afford the purchase of such silks. Dealers in silks throughout the land are the active distributors and refer to Mallinson as to the standard of perfection.

Mallinson has rolled away the rock before the cave of American silks and revealed a land of promise to the silk makers and the silk buyers of the nation.

SURPASS CHEMICAL CO.

Among the discoveries which have been made in connection with the finishing division of the textile industry, the Autogyp Process, which was introduced by the Surpass Chemical Co., of Albany, N. Y., is one of the most prominent. This process enables the dyer to dye cotton and cotton materials of all kinds in all shades, particularly in light and bright shades, without the necessity of previous bleaching. Up to the time when this new method was offered to the textile industry, a preliminary requirement of dyeing cotton was bleaching. The Autogyp Process bleaches and dyes in one bath. Furthermore, it eliminates all specks, motes, leaf and shives in the same operation, and in only three hours. The use of chloride of lime or other hypochlorites with their concomitant danger of weakening and tendering the fibre is entirely obviated. The process is effected in reel dyeing machines and no kier is needed. Makers of cotton underwear and hosiery have found this process one of the greatest improvements in manufacturing Mako, Egyptian and other light shades on all kinds of their products since such materials have been dyed. It is also used to advantage in dyeing warps on the beam, cotton yarns in the skein or on the cone, in the manufacture of lace curtains, knitted cotton glove cloth, such as Chamoisette, Suedetex, Atlas cloth, etc.

Economy is one of the advantages of Autogyp, as it saves boiling out in kiers or other appliances with the disagreeable bleach which may injure the fibre. It also saves from four to seventeen hours in time because the process of separate bleaching and dyeing requires from seven to twenty hours in order to obtain the desired shade and by its use the complete operation can be performed in three hours. Without the

use of the Autogyp Process, six separate steps or operations would be necessary. To give a few figures, it saves three and a half percent shrinkage, twenty-five percent of tensile strength, fifty percent of steam, thirty percent of labor, ninety percent of water, and all the chemicals used in the chloride of lime method of bleaching. In using it no special equipment or appliances are needed nor any special skill. It produces a better looking and better feeling fabric. It also produces perfectly level and evenly dyed shades and a perfect uniformity of shades. It can be readily seen that the Autogyp Process to a certain extent, at least, is revolutionizing the dyeing of cotton and cotton materials.

In using this process the material is run into the dyeing machine and thoroughly wet Sufficient out in any convenient manner. cold water to thoroughly cool the bath and in which to properly work the material is now run in the machine. Two to three percent of Autogyp dissolved in cold water and suitably diluted is now added to the bath. The necessary dyestuff in a well diluted solution is then slowly added to the bath and the goods allowed to run ten minutes. Steam is then turned on and the bath allowed to come to a boil very slowly and gradually, and held at or close to a gentle boil for one hour: steam is then shut off and the goods allowed to run thirty minutes longer without steam. The bath is then drawn off and the goods rinsed twice and extracted.

Other products of the company include the Autogyp Assistant, for use in the Autogyp Process, Surpass Anti-Chlorine, Surpass Cotton Softener, Surpass Bleach Assistant, Surpass Soluble Oil, and dyestuffs. H. B. Smith is president of the company and E.

M. Smith is secretary-treasurer.

UTICA KNITTING CO.

The compass of the textile industry is so immense that it may be divided into separate units of great single industrial strength. The manufacture of knit goods is an industry within an industry. Forty years ago the total value of knit goods produced in the United States was \$26,000,000; in 1914 it had risen to \$260,000,000, ten times as much. The 192,000,000 garments of underwear made in 1899 became 324,000,000 garments in 1914. The span in time also represents increases of fifty to 200 per cent in equipment, physical property, etc. Figures, however, are a cold form of stimulant to the imagination, but they do prove that American knit goods manufacturers

justified its title to the claim by years of strict adherence to the principle.

The Utica Knitting Company adopted the ideal of quality without reservation and allowed no consideration to swerve it from its policy. That policy was to produce first class goods regardless of price or market conditions. To carry out so uncompromising a program has needed men capable of developing high productive capacity while preserving quality of product and efficiency of operation. The man to whom greatest credit is due, who is regarded as having been the leader by his associates, is the founder of the business, Quentin McAdam.



Mills of Utica Knitting Company

have been busy building up their industry. Under the pressure of war needs, an unprecedented state of activity set in after 1914, exceeding all previous records and establishing a high level likely to be even bettered by the post-war order of things. Huge contracts, both domestic and foreign, have poured in upon the knitting mills.

The progress achieved is aptly illustrated in the growth of the Utica Knitting Company and its mills, an alliance of productive power that looms large in the underwear trade. The small beginning made in 1890 has unfolded into a \$5,000,000 corporation. Cause and effect worked here as everywhere. The Utica Knitting Company has had one paramount ideal—quality. Whatever triteness may cling to the assumption of such a commonly advertised virtue, the company in question has amply

Mr. McAdam began the manufacture of underwear at Utica, N. Y., prior to 1890. The year 1890 was an eventful time for the new enterprise. The Utica factory being discontinued, removal was made to Clinton, N. Y., where was formed the Clinton Knitting Company. Before the twelve months had passed the Clinton plant had burned to the ground and Mr. McAdam had resumed the manufacture of underwear in Utica, occupying what was known as the Lowery Mill on Franklin and Fulton streets.

The first Utica Knitting Company received its New York State charter in December, 1891, and had a capital of \$20,000. The business of the company was attended by steadily mounting prosperity, which necessitated the addition of new buildings, purchased and constructed, and periodic increases of capital. When the

need of a spinning plant was felt plans were materialized in the Utica Spinning Company, incorporated in 1899, and operating 30,000 spindles. The last named company was administered as a separate concern until 1900. A red letter year ensued. In 1900 the Utica Knitting Company, the Utica Spinning Company, and the Oriskany Falls Knitting Company-all hereto allied interests—were merged into one company under the name of the Utica Knitting Company. In 1911 another consolidation was effected between the Waiontha Textile Company and the Utica Knitting Company, after which the latter corporate name was retained. The difference between the original and the present capitalization is so great that it is worth while noting the sequence of steps in the financial ladder. The increases of capital were made as follows: In 1893 to \$50,000 and again the same year to \$100,000; in 1895 to \$200,000; in 1900 to \$500,000; in 1901 to \$750,000; in 1908 to \$1,500,000; and in 1918 to \$5,000,000.

The Utica Knitting Company has a chain of plants situated respectively at Utica, Sherburne, Oriskany Falls, Richfield Spa, and Clayville, New York. Altogether, eight mills are run, having equipment totals of 52,000 spindles, 1766 sewing machines, 987 knitting machines, twenty-eight sets of

woolen cards, and fourty-four wool mules. These mills give employment to approximately four thousand operatives. The product is officially listed as flat fleeced, rib fleeced and spring needle ribs, in light and heavy underwear for men, women and children.

The assured quality of Utica Knitting Company products has given them a solid hold on the market. Vellastic underwear, for instance, is one of the best selling garments of its kind distributed. The keen business talents of the officers and individual members of the organization unite in team work bound to induce success and uphold the integrity of the house. The officers of the corporation are: Wm. T. Baker, president; O. W. Gridley, treasurer and general manager; Walter D. Jones, assistant treasurer and assistant manager; and George W. Oatley, secretary and assistant treasurer. John W. Allis is vice-president and sales manager in active charge of the New York sales headquarters at 350 Broadway. Ralph M. Jones is the general superintendent of the knitting mills. The board of directors is composed of Wm. T. Baker, John W. Allis, George W. Oatley, O. W. Gridley, Edward A. Bond, W. T. Dunmore, George I. Hovey, Chas. B. Rogers, John A. Losee, Fred W. Shibley, Walter D. Jones, Ralph M. Jones; and F. X. Matt.

PASSAIC WORSTED SPINNING CO.

The Passaic Worsted Spinning Co. operates at Passaic one of the group of mills which, with those of other nearby New Jersey towns, is responsible for New York City's being so great a factor in the textile field. Easy accessibility to the metropolis is counted by the firm as one of the principal contributing causes of the steady demand for their guaranteed worsted yarns. This natural advantage, important as it is, is second, however, to the firm's policy of giving the customer what he buys both in quantity and quality.

Alpha Garth, now the president and general manager, Christian Bahnsen and Otto Bruckner established the Passaic Worsted Spinning Co., in 1910. Capitalized at \$600,000, its annual turnover to the New England trade is 1,250,000 pounds. There are 500 workers in the Company's Passaic mills, most of whom have been there for years. On account of being located near

New York, the Company was able to build up a dependable corps of operatives before the war, and this organization has remained practically intact in spite of recent labor unrest.

The personnel of the Company in addition to the officers named includes C. W. Hammill, vice-president, Shearson Hammill & Co., New York City; Walter Johnson, treasurer, New York City; E. Baldwin, New York City, director; William Drake, of W. C. Gaunt & Co., Boston, director; and Walter Wright, secretary.

Present officers are: Alpha Garth, president and general manager; H. R. Holdsworth, vice-president and assistant treasurer; Walter L. Johnson, treasurer; Charles F. Rupp, secretary; directors, Alpha Garth, Passaic, New Jersey; H. R. Holdsworth, Passaic, New Jersey; W. H. Drake, Boston, Massachusetts; Walter L. Johnson, New York City and C. W. Hammill, New York City.

CARL SCHOEN SILK CORP.

As the direct successor of a business more than thirty years old, the Carl Schoen Silk Corporation was organized in 1918, with Mr. Carl Schoen as president. This business succeeded the old corporation of Reliing & Schoen, the members of which were Mr. Joseph L. Reiling, president; and Mr. Carl Schoen, vice-president. Prior to this organization was the one known under the name of Reiling, David & Schoen and this latter business was founded by Mr. Schoen more than thirty years ago. Thus, the present organization is now the successor of that business established more than a generation since.

At the inception of the enterprise it was naturally very small, in fact, having less than fifty looms, but the growth has been steady and permanent until today the corporation controls three mills, as follows: The Penikees Mills at Valley Falls, Rhode Island; Petersburg Silk at Scranton, Pennsylvania; and what is known as the R. & S. Mill at West Hoboken, New Jersey.

The business was originally organized for the purpose of manufacturing tie silks, but is has since branched out into the making of large quantities of dress silks as well as shirtings. The products are put on the market under the trade names of "Penikeese Silks" and "Silkendure Silk Shirtings."

"Penikees Silks" include the well-known "Penikees Canton Crepe Satin," "Penikees Canton Crepes," "Penikees Rhapsode," and a very extended list of popular fabrics which are being nationally advertised in some of the most important trade and consumers' magazines in America.

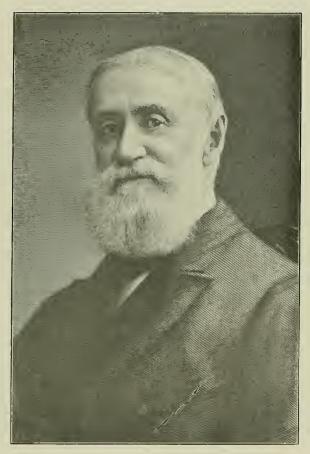
The mills are all equipped to make—and are making—some of the highest class novelties on the market including magnificent brocades and plain fabrics.

The management, early recognizing the fact that this country demands the best service and wear in its textiles, have directed their efforts towards the production of the best class of merchandise and goods of the dependable sort. The value of this course is becoming more and more recognized by the trade and consumer.

The Carl Schoen Silk Corporation maintains New York offices and sales rooms at Fourth avenue and Twenty-First street.

JAMES TALCOTT, INC.

James Talcott, Inc., incorporated 1915, is the legatee of proud traditions reflected in its present business life. The Corporation finances and sells the products of numerous American mills. Through the main offices, merchant on Liberty street, in 1854. Later he was a vice-president of the New York Chamber of Commerce and connected with other influential bodies. He contributed very generously to religious and educational



JAMES TALCOTT

225 Fourth avenue, New York, and many branches and annexes, it conducts extensive domestic and foreign trade in woolens, cottons, silks, gloves, underwear, dress goods and all other lines.

The founder, James Talcott, who died August 21, 1916, was a representative New York merchant whose career was one of constructive labor. He began as a commission work and was a highly esteemed patron of the arts and sciences. His son, J. Frederick Talcott, president and treasurer, succeeded him. Other officers are: Charles E. Mathewson, vice-president and general manager; Frances E. Talcott, secretary; James Talcott, Jr., assistant secretary and assistant treasurer; and James L. Cox, Thomas J. McGann, and Hooker Talcott, assistant secretaries.

COLOR SERVICE CORPORATION

ORGANIZATION OF THE FORMER

KALLE COLOR & CHEMICAL CO., INC.

Originally this business was founded in 1864. It was then known as the co-partnership of Leisel & Halbach, and so operated for twenty years. Upon the decease of the senior member, Mr. Leisel, in 1884, the co-partnership of Kalle & Company was



CARL GEORGI

formed, with premises situated on Pearl street, New York City.

The first class of colors produced was the croceine scarlet group, which quickly won renown in American textile fields. These were followed by a line of acid colors, and in 1890 the increasing output necessitated removal to 77 John street and the addition of 86 John street, for laboratory and warehouse purposes. That year, rosinduline, along with the first direct yellows and oranges, was introduced, followed in 1896 by a line of naphtamine blues, patent blacks and other colors.

Carl Georgi, considered an eminently successful executive, headed the firm from 1884 until his retirement in 1903. He died later while in Europe on a recreation tour. A reorganization occurred in 1905, placing in the presidency A. G. Bruinier, who had

formerly been manager of the Boston branch and enjoyed widespread popularity. Another reorganization, changing the title to Kalle Color & Chemical Company, Inc., occurred in 1914. E. Fischer became president, but when the war broke out in August, 1914, Mr. Fischer having but shortly before this left for Europe, Curt G. Siegelé took charge during the trying months, successfully nneeting the difficulties that beset the business in the critical period following.

Under the leadership of Mr. Siegelé, who assumed direction in 1918, this organization retains its long established rank in the dyestuffs trade. The disturbed economic conditions of the period of reconstruction inflicted onerous hardships upon chemical houses, but this firm rests on the foundation of efficient staffs who have been a part of the organization for from ten to twenty-five years.



CURT G. SIEGELÉ

The firm is fortunate in the capability of its representatives who have been identified with it through years of growth. The various branch managers of the Color Service Corporation are, Frederic A. Wallace, Providence office; Harry Broom, Philadelphia office; Paul O. May, Chicago office; Russel C. Winter, Boston office. popular and successful representatives were George R. Finley, former manager of the Boston office and representative in Connecticut, and Irwin J. Smith, formerly



Main Office of Color Service Corporation, New York City

Its other representatives are Michael J. Morrissey in Pennsylvania; Charles M. Dunn, Connecticut; Oscar Goldschmidt, New York State; William May in New Jersey and New York City; and E. Empting in the Southern States. Two of its eminently

representing the Company in New York State, both of whom death claimed during 1920.

All of these gentlemen have auspicious careers behind them and are well known throughout various localities.

J. P. STEVENS & CO.

The commission merchant or selling agency organized originally to relieve the manufacturer of the annoyance and detail of marketing his products has grown into an industry of tremendous proportions centered mainly in the great marketing cities of the country. The business of the larger organizations is represented by branches throughout the entire country. The manufacturer, usually an expert at weaving cloth or installing machinery, controlling employees, and in keeping abreast with the demands of the world's markets, is often unfitted for the selling or financial end necessary to disposing of the products of his mill. The selling agencies organized especially for the financing and selling of the mills' products are experts in this particular branch. The largest number of commission houses is now centered in New York.

The firm of J. P. Stevens & Company is a leader in this particular branch of the textile business. The House bears a name so universally known in conjunction with the larger enterprises of the American textile field that its origin and history are of interest to those who are investigating the

textile industry.

A hundred and more years ago (in 1813, to be exact) one Nathaniel Stevens purchased from Governor Bradford, a small property known as the Andover Mill on the Cochichewick River in Massachusetts. The War of 1812 was then devastating the seas, commerce with foreign countries was at a standstill, and a pronounced demand for woolen goods of American manufacture furnished the motive for Stevens' investment. A two-story wooden building 36 x 40 feet housed the original plant. The excellence of the product soon became known and the plant was twice enlarged under the management of the original Nathaniel Stevens.

Moses Tyler Stevens, son of Nathaniel, entered the employ of his father in 1843 and in 1850 was made a member of the firm. George and Horace, brothers of Moses, were also admitted into the concern. Increases in business led to the purchase of a mill in Haverhill which was put into operation in 1854, and to the acquirement of another mill in Franklin, N. H., in 1870. Upon the death of his two brothers in 1876 Moses Tyler Stevens became the sole owner of the business, and he lived and conducted

it until the year 1907, and with his sons, Nathaniel, Samuel D., and Moses Tyler Stevens, Jr., enlarged upon the successes of his father, the original owner, and built industries of impressive proportions.

Moses Tyler Stevens, the elder, was a noted citizen of Andover, Mass. He was president of the Andover National Bank and one of its directors for more than fifty years. He was also a director or trustee in other banks and several insurance companies, and held a position of high respect in the town councils, contributing time and money to the growth and prosperity of the community. He served in both branches of the State Legislature and was elected to Congress for two terms. He owned and controlled the Stevens Linen Works of Webster, Mass., and was president of that corporation which was established in 1846. He was succeeded in the management of this mill by his sons, Nathaniel Stevens, now president, and Samuel D. Stevens, a director,

M. T. Stevens & Co., as now constituted, is an organization of important proportions. While the mills owned by it are modestly capitalized, the value of the properties totals millions of dollars. Nathaniel Stevens is president of the organization and Abbot Stevens, treasurer. In addition, the board of directors includes Samuel D. Stevens, Moses T. Stevens, Samuel D. Stevens, Jr., J. P. Stevens, and Carl Vetter, who is gen-

eral superintendent.

The Stevens Mill at North Andover, of which a picturesque and ancient view is herewith given, is, as noted before, the parent mill of this organization. It has been greatly enlarged and modernized since the date when the sole structure was that part of the central building shown at the left of the tower. Worsted goods are the product of this and all the Stevens mills which include the above, the Osgood Mills at Andover. the Morland Mills of Andover, the Pawtucket Mills at Haverhill, the Franklin Mills at Franklin, N. H., the Peace Dale Mills, at Peace Dale, R. I., which are the last of the mills to date to be brought under the Stevens ownership. The Peace Dale Mills are also of historical interest, having been in existence more than a century.

The individual stamp of character and quality borne by the Stevens fabrics is being marketed throughout the textile world, abroad and at home, by the House of J. P. Stevens & Co., which has its main office at 23 Thomas Street, New York, and salesrooms in the up-town textile district at 25 Madison Avenue, New York.

J. P. Stevens, a grandson of the original Nathaniel Stevens who created the Andover Mill property, is at the head of the selling organization which has been moulded through his ability into one of the most influential and progressive in the textile field. Mr. Stevens entered the textile business in 1884 and possesses the accumulation

reputed mills in Massachusetts and the South.

The Stevens Linen Works, already mentioned, with an annual production of over 14,000,000 yards of linen crash; the Methuen Company, of Methuen, Mass., one of the early established mills incorporated in 1882, the products of which are napped fabrics; the Pemberton Company, of Lawrence, Mass., established in 1860, manufacturers of cottons, fancy shirtings, bath robe flannels and tickings, are also represented by the J. P. Stevens & Company.



Original Mill of M. T. Stevens & Sons Company, Andover, Mass. Business was Established in 1813 by Nathaniel Stevens. The Original Stevens Mill is that Portion of the Central Building to Left of Tower

of almost 40 years of experience in the service. His acquaintance with the textile side of manufacturing and the practical elements of financing and distributing is mainly responsible for the successful and flourishing condition of this firm and has gained for the House a record of altertness and reliability that attracts the patronage of most discriminating class of merchants.

The range of goods distributed by J. P. Stevens & Company extends through woolens, worsteds, cottons and linens. While they have been particularly identified with the products of the Stevens mills, they control the output of a number of other highly

In the South a number of progressive cotton mills find markets for their goods through this enterprising company. Among them are the Aragon Cotton Mills, the Glen-Lowery Manufacturing Co.; the Duncan Mills; the Watts Mills; and the Baldwin Cotton Mills, all of which are located in South Carolina.

While the associations of the Stevens firm extend back to the very origin of American textiles, the policy of the House is one permeated with enterprise and possessing the conservatism and straightforwardness which descends upon it through a long line of honorable connections.

TALBOT MILLS

From the early years of their operations the Talbot Mills, North Billerica, Mass., have always been spoken of as a company which gave considerate treatment to employees. Within the last few years, the Company has accomplished particularly notable welfare work. This, also maintenance of quality of product and the greatest production consistent therewith have been the strongest factors in making the plant one of the most successful in the country.



FREDERIC S. CLARK

The history of the Talbot Mills dates back to 1851, when Ebenezer Chadwick, president of the Middlesex Canal Company, conveyed the property, at that time used as a grist mill, for \$20,000 to Charles P. Talbot, of Lowell, and Thomas Talbot, of Billerica, manufacturers and co-partners. The purchasers were brothers carrying on business in North Billerica under the firm name of C. P. Talbot & Co. The property consisted of water power, stone dam, and over 20 acres of land with the buildings thereon.

C. P. Talbot & Co., were also grinders of dye-woods and manufacturers of chemicals and conducted this business from 1839 to 1884. In 1857 the Talbot Mills were established by mutual agreement with a woolen company which continued until October 1, 1862, when C. P. Talbot & Company took full possession.

Thomas Talbot took a keen interest in affairs of state and his ability was recognized by his election to the legislature on the Republican ticket for two terms. He was on the governor's council from 1864 to 1869 inclusive. In 1873-1874 he was lieutenant-governor and in the later year acted as governor during the unexpired term of Governor Washburn, elected to the United States Senate. In 1878 he was elected governor.

He became president of the Talbot Mills in 1884, at which time the woolen manufacturing portion of the business was incorporated, and acquired a two-thirds interest in the property. When a boy, Governor Talbot had worked as an ordinary operative in a woolen mill at Northampton, Mass., and had also been employed by his brothers in their broadcloth mill at Williamsburg, Mass. In his days of prosperity he did not forget, like some other manufacturers, that he had done so. During the long business depression, beginning in 1873, when there was very little demand for the product of the mill, he continued to operate it, paying the old scale of wages.

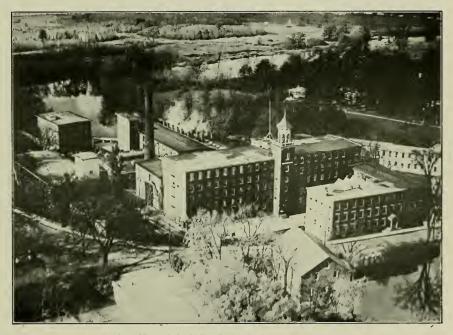
The value placed by the management upon the faithful employees is further found in the pension system in force since March 6, 1903, when Frederic S. Clark, now president, was treasurer. This provides a substantial pension for those who have been in continuous service fifteen years or more.

The most distinctive benefits that the Talbot family have accomplished are the improvements in the living quarters and the surroundings of the mill employees. The corporation built the model houses, which are rented at very reasonable rates to mill families, and also laid out the grounds. A systematic course of instruction has been carried on. The company furnishes equipment to keep the grounds in order. The company has also laid out the Talbot Oval, or small park, which serves as a sort of model. Prizes are offered by the company each year for the best kept premises, gar-dens, etc. The Thomas Talbot Memorial Hall, accommodating 400, and lighted by electricity, is the meeting place for all social events. In the basement are smoking rooms and kitchen.

The company erected a library some years ago. Four thousand volumes are now on file and substantial additions are made each year. Current literature is also pro-

vided in an attractive reading room. A large room over the office buildings is furnished with tables where the operatives bringing their dinners may enjoy the meal. They can also purchase coffee, tea and milk at cost prices if they desire. A rest room is provided for the women and the men have a smoking room. The social and church organizations are liberally helped over hard places by the mill management.

ber of the executive committee of the National Association of Wool Manufacturers in 1895, one of the vice-presidents in 1904, and was president from 1918 to 1921. During the war, he was chairman of the War Service Committee of the Wool Manufacturing Industry and chairman of the special committee appointed by General Goethals to revise the specifications of the army fabrics.



Airplane View of the Talbot Mills, North Billerica, Massachusetts

It can be readily seen that Frederic S. Clark, the president of the company, has never departed from Governor Talbot's policy of fair dealings with the operatives. His efforts have been directed to reducing the handling of stock in process to the minimum. If handling is absolutely necessary mechanical aid is provided when possible.

President Clark has always been prominently identified with the organizations of the wool manufacturing industry. He was one of the original members and directors of the American Association of Woolen and Worsted Manufacturers and its president in 1910 and 1911. He was elected a mem-

The Talbot Mills is a close corporation, as practically all the stock is held by the descendants of C. P. and Thomas Talbot. On a capitalization of \$500,000 the turnover in 1920 was \$3,250,000. The number of employees is 425. The products include woolen and worsted fabrics for men's and women's wear. Their specialties are thibets, suitings, broadcloth, velour, uniform cloths and billiard cloths. The trade territory is the whole United States. The company believes in a policy of advertising and follows it up in the trade publications. Frederic S. Clark is president, as noted above, and Thomas Talbot Clark, treasurer and clerk.

HARDING, TILTON & CO.

A prominent firm in the textile industry is that of Harding, Tilton & Company which acts as selling agents for several of the largest mills in the country and which has its principal offices at Boston, New York, Chicago and Philadelphia. This Company specializes in handling yarns and grey goods. It was established in 1909 by Mr. Charles L. Harding, of Boston, and Mr. Newell W. Tilton, of New York. Mr. Harding was formerly connected with the firm of Harding, Whitman & Company of New York and Boston.

which will afford some estimate of the magnitude of the business under the direction of this firm.

The cotton goods which are sold by Harding, Tilton & Co. are manufactured by the Whitman, Gosnold and Page mills of New Bedford. The cotton yarns are the products of the Holmes and Fairhaven Mills of New Bedford, the Nyanza Mills of Woonsocket and the Cynthia Mills of East Boston. The worsted yarns are manufactured at Woonsocket by the Samoset Mills, and at Dedham, Mass., by the Dedham Worsted



Fairhaven Mills, New Bedford, Massachusetts

The mills which this Company represents, many of which are illustrated above showing their colossal extent, are as follows: The Holmes Mfg. Co. The Page Mfg. Co., the Fairhaven Mills, the Whitman Mills, and the Gosnold Mills, all of New Bedofrd, Mass; the Nyanza Mills and the Samoset Worsted Mills, of Woonsocket, R. I.; the Lustron Company of South Boston; the Cynthia Mills of East Boston; and the Dedham Worsted Mills, of Dedham, Mass. Mr. Charles L. Harding is president of the Holmes, Page, Fairhaven, Whitman, and Samoset Mills.

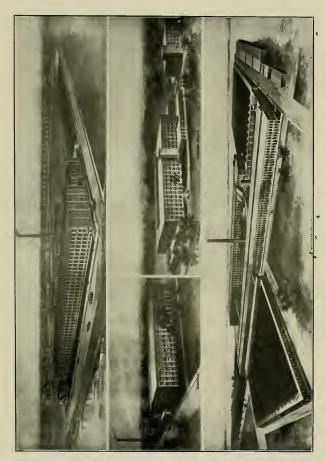
These mills represent a combined working capital of about \$25,000,000 and give employment to about 9000 hands—facts

Mills. The artificial silks which are sold by the Company are the products of the Lustron Company of South Boston. The plain and fancy cotton and silk cloths manufactured by these various mills and handled by Harding, Tilton & Company are unsurpassed, and are regarded as among the finest on the American market.

Boston is the headquarters for the yarn accounts with a selling organization in New York, Chicago and Philadelphia. The cloth accounts are handled exclusively from the New York office.

The trade territory of the firm is world-wide and its progressiveness is a marked feature of the textile industry of this country.

304



Some of the Mills which Harding, Tilton & Company Represents

CRANSTON PRINT WORKS

William Sprague, first of his name, resident in Cranston, R. I., was a well-to-do farmer. The Pocasset, a branch of the Pawtuxet River, ran through his farm, and on it he had a saw and grist mill, the site of which is now covered by the Cranston Print Works. At his death this passed into the possession of his son, William, born June 5, 1773.

We have no authentic information as to when he first engaged in cotton spinning, and there is nothing on record to indicate this. In the "History of the Sprague Families of Rhode Island," by Benjamin Knight, Sr., published in 1881 is stated:

"As early as 1808, his grist-mill, standing near his saw-mill, he converted into a small cotton-mill for carding and spinning yarn."

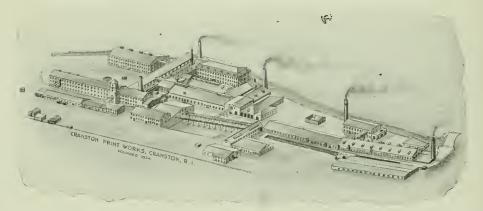
The first reference to this mill is in a

Cranston, so that in 1821, he purchased an interest in the Natick Mill.

In 1824, bleaching and printing began in his mill at Cranston, and foundations laid for what, in a few years, became widely known as the "Cranston Print Works," one of the largest of the kind in the country. The first printing machine was built at Cranston or at Providence, for two colors only, any additional colors being printed by hand with blocks.

William Sprague pursued his business, both at Cranston and at Natick, with continued development and success until his death on March 28th, 1836, when it became the property of his two sons.

It is uncertain when the cotton factory, as such, ceased operations, and the buildings



deed, dated February 3, 1812, by which William Sprague conveyed to Rufus Sprague certain real estate and "one eighth of my cotton mill."

About 1813 the mill burned. On its site was immediately erected a larger one of stone, equipped with new and improved machinery. Assisted by his sons, Amasa, then a lad of fifteen, and William, about two years younger, and his daughter, Susanna, who reeled the yarn which her brothers had carded and spun, he soon had his business again well under way.

There was no change, worthy of note, during the next eight years, some three or four of which were years of special depression in the textile industries of the country, but William Sprague made steady progress and acquired capital, more indeed than was needed for the operations of his mill at

devoted entirely to bleaching and printing. The property was conveyed by Zachariah Chafee, trustee, to the Union Company, March 9, 1883. That company sold it January 26, 1885, to the Cranston Bleaching, Dyeing, and Printing Company. The latter conveyed it June 29, 1888, to the Cranston Print Works Company, in which Messrs. B. B. & R. Knight, of Providence held a controlling interest.

The Cranston Print Works, with their community village, many years the most important industrial center in Rhode Island, were bought July 1, 1920, by the Tate Electrolytic Textile Processes, Incorporated, whose present electrolytic waterproofing plant provides a maximum waterproofing and converting capacity of about 30,000,000 yards a year, the Print Works, a bleaching and printing capacity of twice that yardage.

TATE ELECTROLYTIC TEXTILE PROCESSES, INC.

Waterproofing, as the name implies, is the process of subjecting a fabric or material to some application by which it is

rendered impervious to water.

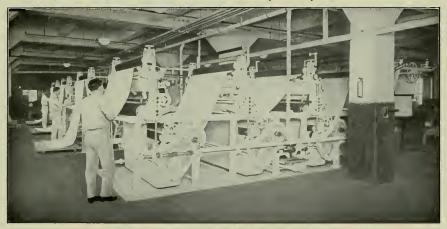
Since the days of 1835, when Mr. Helliwell of Salford, England, patented a method of rendering fabrics waterproof on immersion in a solution of rock alum and whiting in water, and afterwards treating with soap and water, many methods have been pursued, confined strictly, however, to two processes—the one mechanical, and the other chemical.

The mechanical processes embraced all methods which involved direct impregnation, filling or coating of these fabrics with parted but short life to the waterproof coating they created.

Thus in the one, ventilation was completely checked through the clogging of the pores of the fabric, and in the other, the surface coating, grease film or veneer, through wear and exposure to the drying influence of the atmosphere, rapidly deteriorated, and left the fabric in its original absorptive condition.

Such was the status of waterproofing, as applied to textile fabrics, until a few years ago, when the subject first attracted the attention of Alfred O. Tate, a specialist in the development of the electrolytic cell.

The problem presented for solution at the



View of Machines in Operation at the Plant of the Tate Electrolytic Textile Processes, Incorporated

rubber, waxes and various compounds which achieved the result of rendering them proof against the penetration of both water and air. When attempt was made to use them in association with fabrics intended for specific uses wherein ventilation was an essental factor—notably for apparel such as raincoats—the results were unsatisfactory from the viewpoints of both comfort and hygiene.

The chemical processes, on the other hand—the Aluminum Soap, Lanolin, cuprate of ammonia processes, and the like—embraced all methods whereby a coating of waterproofing substance was deposited on the surfaces, yarns or fibres of textile fabrics through the media of chemical reactions. These processes, while they preserved the quality of ventilation in most instances, im-

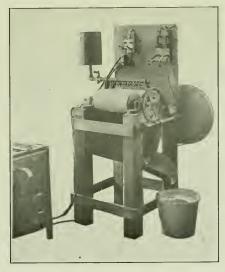
initiation of Mr. Tate's experiments was the discovery of a process which would permanently, not temporarily, suspend capillary attraction in textile fabrics of wool, silk, cotton and their various admixtures, without decreasing the porosity upon which ventilation depends. For capillary attraction—and water enters a textile fabric chiefly through the action of absorption due to the dynamic force known as capillary attraction—once suspended or destroyed, the fabric becomes non-absorbent and is, therefore, practically waterproof for the reason that the pressures required to force water into its pores are usually much greater than those produced by natural phenomena.

A cotton fibre may be described as a

A cotton fibre may be described as a cellular tube possessing microscopic pores which absorb moisture through the action of capillary attraction. Wool and silk fibres are of different structure but they also possess capillaries which act in a manner relatively the same as those of the cotton fibre. These microscopic pores are so minute and distributed in such form throughout a fabric of textile manufacture that no mechanical method expressed by pressure has been devised for filling them, while chemical reactions involving the deposition of a water-repellent substance served at most only to coat or veneer the fibre, leaving the capillary pores in condition to resume their absorptive functions when the veneer or coating was either partially or wholly destroyed.

hydroxid by a method involving the use of a series of electrolysed rolls between which, after preparation with suitable reagents, the fabrics are passed.

Chemical reactions thus induced occur under the influence of an amplified osmotic pressure due to an electric current flowing through the fabric from a positive to a negative roll, which causes penetration of the fibre pores by the insoluble salts formed during the critical period of electric contact. These fillings cannot be removed by external friction which may be exerted to the point of abrasion without affecting them. They are so minutely concealed, and the



The Original Tate Electrolytic Waterproofing Machine

It was obvious that if these minute absorbent pores of the fabric could be filled with a permanent water-repellent substance, which should in no way impair the quality of ventilation, the object sought would be obtained. And to maintain the quality of ventilation it was imperative that only these minute pores of the fibre be filled, and not the interstices of the fabric itself, caused by the multi-fibred threads as they cross each other in the warp and weave. After a long period of experiment involving the use of the principle that an electric current generates in fluids the force or pressure known as electric osmosis, Mr. Tate succeeded in filling these microscopic pores with a combination of insoluble metal palmitate and repellent nature of their substances is such that they will withstand the supremely severe test of molecular friction induced by boiling water.

The life of the water-repellent qualities thus contributed to any fabric is co-extensive with that of the fabric itself. In addition to this, the quality of ventilation is permanently preserved.

The results of the process are so extraordinary and unprecedented that they literally compel attention.

A woolen, treated by this process, will not only withstand all pressures induced by natural phenomena, such as rain or snow, but will retain this water repelling quality for just so long as the fabric may last—and without in any way impairing its quality of ventilation.

Even should water be forced by concentrated pressure through any given section of total surface area, the penetration is confined to that particular section, as no expansion can occur through absorptive action which, under similar conditions, would cause untreated fabrics to become saturated throughout all, or a relatively wide section, of their structure.

And because of this process, even though penetration occur through such concentrated pressure, TATELEC treated woolens, unlike all others, when dried revert to their

original water-repellent condition.

A silk or cotton, treated by this process, not only becomes permanently water repelling, and permanently porus, but there is also a manifest thickening of the fabric causing it to feel heavier to the sense of touch, though there is no appreciable increase in weights between the processed and unprocessed goods. In a cotton especially is the transformation, or more properly conversion, most pronounced; changes of greater refinement in appearance and texture are produced and lustres varying in degree from the depth sheens, usually associated only with natural silk fabrics, to the brilliant surfaces which distinguish the most highly finished satins-all confirmed and emphasized by the sense of touch.

In addition to the above, all fabrics subjected to the Tate process become mildewproof as attested by numerous tests under the most severe conditions. In its relation to textile fabrics of cotton manufacture, as used for tents, awnings, sails, tarpaulins, etc., this feature involving preservation and prolonged utility is as valuable as the waterrepellent quality. This process also performs co-incidentally and thoroughly the operation of shrinking and converting and all fabrics thus treated undergo no subsequent structural change of this nature through atmospheric or other action relating to the influence of moisture.

But most remarkable of all is the fact that not only does this process tend to fasten all fugitive dyes and render them impervious to water, but in addition to this, all textile fabrics so treated are unaffected by the action of solvents, such as gasoline, benzine, or other hydrocarbons commonly used for cleansing, so that they may be subjected to dry-cleansing without impairing their water repellent qualities.

The development achieved under the Tate patents marks a long forward step and denotes the greatest advance made in the art of waterproofing textile fabrics since its achievement was first attempted nearly a

century ago.

Furthermore, the Tate process does not represent development through projection of, and improvement upon, pre-existing methods. It is differentiated fundamentally and in detail from all methods heretofore known or employed. It represents the initial introduction to the world of the use of electrolytic phenomena as transmuting media in processes of textile waterproofing and converting, and denotes the creation of a new art, complete within itself, which comprehensively, may be described as The Art of Electrolytic Waterproofing and Converting of Textile Fabrics.

WEST. BAKER & CO.

The firm of West, Baker & Company, was established January 1st, 1910, by Edwin H. Baker and William T. West. The business was originally conducted at 61 and 63 Worth street, New York, but is now located at 45 East Seventeenth street.

Cotton goods, including plain, colored, and fancy weaves-the product of a group of well rated mills-are distributed throughout the United States and exported to foreign countries. Specialties are carried for the jobbers, cutters, and converters.

MOHAWK VALLEY CAP FACTORY

Started in a small way in 1876, manufacturing "Scotch bonnets" at New Hartford, N. Y., the Mohawk Valley Cap Factory has had a constant advancement and development, until now it does an annual business of approximately \$5,000,000 a year, selling goods throughout the United States and in Canada and in some other sections of the world. The company is capitalized at \$600,000 and employs about

and its branch plants at Newport, N. Y., and Champlain, Ill., are worthy offshoots of Utica headquarters. Utica as a city is a particular source of pride to John E. Mc-Loughlin, president and general manager, and also to R. P. McLoughlin, treasurer and manager. The former has been one of Utica's mainstays since 1884, when the company moved to its present site, and R. P. McLoughlin has been actively associated



JOHN E. McLOUGHLIN
President and General Manager of Mohawk Valley
Cap Factory and Associated Companies

1,500 hands, the larger proportion being Americans. Its factory at Utica, N. Y., is one of the largest of its kind and equipped with the latest machinery known to the knit goods trade, of which Utica is the center for the whole country, its manufactured product in this commodity alone being close to \$60,000,000 a year.

The Mohawk Valley Cap Factory and

The Mohawk Valley Cap Factory and associated companies constitute a mighty factor in this industry in the knit goods city, occupying nearly three full city blocks,

with the town and its industrial progress for more than twenty years. There isn't anything "R. P." doesn't know about the manufacture of Scotch knitted caps and sweaters and high grade underwear, for he began at the very bottom of the ladder and never missed a rung until he reached the top.

Thomas Hanford made the first of the Scotch knitted caps in which the McLoughlins have since specialized, and they proved so popular that by 1881 the business had

assumed large proportions and was conducted under the name of the Hanford Scotch Cap Factory. In 1883 the small plant that had been established at New Hartford was found so wholly inadequate that the move to Utica was decided upon. John E. McLoughlin had entered the firm in 1881, and in 1884, when the Utica plant was ready, H. E. Brewster was admitted to partnership and the name changed to the Mohawk Valley Cap Factory. The partnership with Mr. Hanford having expired, he

with the original company. These companies are the La Tosca Knitting, Ritesize Underwear, Supreme Underwear and Newport, N. Y., Textile. The same high principles that have always dominated the parent organization are part and parcel of each one of these subsidiaries. The La Tosca Knitting Company is an example. Here every last detail receives the closest attention and no garment is permitted to pass without the O. K. of thoroughly experienced inspectors who know that the



R. P. McLOUGHLIN
Treasurer and Manager of Mohawk Valley Cap
Factory and Associated Companies

was succeeded by W. Fred Allen, of Utica, and the business was conducted as a partnership until 1892, when it was incorporated under the same name. Mr. Allen became president and J. E. McLoughlin, secretary, treasurer and general manager. Mr. Allen died in 1910, and his brother, George B. Allen, succeeded him. In January, 1917, Mr. McLoughlin was elected president.

As the output of goods of standard quality continued to further increase the firm's prosperity other companies were formed, all remaining to this day closely associated

surest way to incur the displeasure of the firm would be to let the smallest imper-

fection go through.

"We never ask an employee to work for us, but we do ask them to work with us," said a member of the firm when he was asked about the general policy pursued by the Mohawk Valley Cap Factory in regard to labor. "And," he added, "the result has been the best merchandise that human ingenuity and conscientiousness can produce."

This idea of getting employees to take a heart and soul interest in their work has

ever been one of the big aims of John E. McLoughlin, and he has spent money as well as time in its fulfillment. First in Utica to adopt industrial democracy, he and all the other executives co-operating with him are always glad to lend a willing ear to suggestions from employees both for the betterment of themselves or the betterment of the company, "Let us be fair and square with each other at all times." That in a nutshell is the McLoughlin business creed.

The women and girls employed by the company share with the men in the various boons which have been inaugurated and are satisfied that they are working in the right place, for all hands, workers and executives

alike, are one big family.

The Utica plant is situated on a familiar corner, at Broad and Third avenues, where for many years the citv's political leaders were wont to gather at Devlin's to shape the destinies of the community. When Mr. McLoughlin obtained this property he had plans drawn for the construction of a modern office building to be devoted entirely to the business of the Mohawk Valley Cap Factory and the associated companies. This fine building stands opposite old Fort Schuyler and is a great asset to the community.

At Newport, Herkimer County, Mr. Mc-Loughlin is quite as popular as he is in Utica. His new plant there has put the hum of industry in the little place, and he has a further development in mind for the

future.

Altogether, the Mohawk Valley Cap Factory and its kindred plants have won an enviable place for themselves from two notable points of view, namely, the esteem in which they and the men back of them are held by those who work with them and the satisfaction of the customers who buy goods from them. Herein lies the secret of their success.

The present board of directors consists of the officers and George B. Allen, F. R. Winant, and Wm. P. McGrail. Mr. McGrail is sales manager and New York rep-

resentative.



Main Plant of Mohawk Valley Cap Factory and Associated Companies, Utica, New York

312

KNOX WOOLEN CO.

In the year 1864 there was founded on the western continent a new branch of the textile industry. Mr. Samuel Thomas of Laconia, New Hampshire, inventor of the open shed loom, conceived the idea of making paper machine felts, which, up to this time, had been imported from Europe, and interested in the project Messrs. Albert Johnson and Andrew Fuller, who were operating a woolen mill in Warren, Maine. above gentlemen together with C. C. Newcomb, also of Warren, formed a co-partnership under the name of Johnson, Fuller and Company, leased a building in Camden, Maine, and equipped it with two sets of machinery. In the fall of 1864 the first endless paper machine felt made in America was produced by this company.

a position with Huyck & Argersinger of Albany, New York. Mr. Johnson continued as manager until his decease in 1890 when he was succeeded by C. W. Babb and B. C. Adams. The present officers of the Knox Woolen Company are: J. W. Bowers, president; C. W. Babb, superintendent and treasurer; G. A. Babb, assistant superintendent and treasurer. Its capitalization is \$588,000 stock issued and \$415,372.01 surplus and undivided profits.

Its line of products now includes machinery blanketing for all purposes. Buildings and machinery have been expanded till at the present time the Knox Woolen Company has facilities of the most modern and up-to-date character. The trade territory of this firm includes not only all portions



Plant of Knox Woolen Company, Camden, Maine

Many obstacles were encountered, some on account of the difficult nature of the product they had undertaken to manufacture, others from their inability to obtain the proper machinery for the pupose. Much of the latter had to be designed and built by themselves; and other difficulties were at length overcome by persistency and Yankee ingenuity.

Messrs. Bulkley, Dunton & Company of New York were appointed selling agents and have continued in this capacity for more than fifty-seven years. Johnson, Fuller & Company continued in business until 1872 when additional capital was needed to carry on the increasing business, and a corporation was formed called the Knox Woolen Company.

In 1880 Mr. Fuller severed his connection with the Knox Woolen Company and took

of the United States but several foreign countries, principally Japan, Norway, Sweden and Finland.

And though the following two statements may not properly be recorded as history, yet they are placed here because they have been major factors in the success of the company as it is today. Firstly, the employees are more than ninety-five per cent of native American stock, with the remaining few of American birth. Lastly, the policy of Messrs. Johnson and Fuller, who were oldtime manufacturers of fine woolens and produced some of the finest clothes made in this country was to maintain the quality of their felts as high as the best of materials and machinery could produce, a policy which their successors have continued and which is embodied in the name of the felts-"Excelsior," meaning "Ever higher."

EXETER MANUFACTURING CO.

From the earliest days a valuable asset of Exeter, New Hampshire, has been the water power furnished by the descent of Exeter to Exeter tidewater at the head of the Squamscott River. The utilization of this power began early, and in former times Exeter River was dotted with mills for various purposes, such as grist, sawing, fulling, paper making mills, etc. For one reason or another all these mills and industries, save

one, long since ceased to exist.

The exception is the successful textile industry of the Exeter Manufacturing Company, which is now nearing the completion of its first century. It was incorporated in June, 1827. The par value of the shares was \$1,000 and Daniel Webster, the great American statesman, was one of the first stockholders* Three years later began the manufacture of cotton sheetings. The company's wise management and the high quality of its product early won success. industry has long been the principal one of the town, employing in its Exeter plant about 300 operatives and at the mills at Pittsfield, N. H., which it controls, 150 more. Few manufactories have for nearly a century been under so harmonious and regular operation. Labor troubles have been negligible, and, save for infrequent mishaps, shutdowns have been few and brief.

In 1864. Hervey Kent, thoroughly trained in all phases of the textile industry, became the company's superintendent; and with its management, and latterly with its full control, three generations of the Kent family have since been identified. Hervey Kent was its agent from 1876 to 1895 and its president from 1896 to 1906, his service to the company in all capacities extending over forty-two years. His son-in-law, the late Hon. John J. Bell, had previously held

the presidency. George E. Kent, son of the senior Mr. Kent, previously owner and manager of the Pittsfield Mills, was the company's treasurer and agent from 1898 to his death in 1905. To his business ability and wise leadership the company owes much. At one time the latter's elder son, Robert Kent—of the third generation of the family



GEORGE E. KENT

trained to cotton manufacturing-was brought from the Pittsfield Mills, where he had succeeded his father, to the agency of the Exeter plant. He fully rose to the demands of the World War, and under his direction the company did much work for the National Government. His premature death in 1918 was regretted by all who knew him, nowhere more than by his company associates. His brother, Hervey Kent, president of the Exeter Banking Company, has, since June 1, 1921, been the com-pany's treasurer. The foregoing con-stitutes a notable record, and it may be

Mr. Webster appointed Eben S. Andrews, Esq., his attorney, to represent him at all meetings.

^{*}The certificate bore the following:

^{*}The certificate bore the following:

"BE IT KNOWN that—
"Daniel Webster, Esq., of Boston is the proprietor of one share numbered Twenty-five in the Exeter Manufacturing Company subject to such assessments as may be made thereon and to such conditions as are contained in the act of Corporation by the said Daniel Webster in person or his lawful attorney to the president and Treasurer of the corporation of the second of the said of said Corporation to the fixed at the seal of said Corporation to the fixed at Corporation to the fixed at Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said Corporation to the fixed at the said of said corporation to the fixed at the said of said corporation to the said corporation to the

added also that more than a controlling ownership of the company is vested in the Kent family.

The Exeter Manufacturing Company, with plants located at Exeter and Pittsfield, N. H., comprises a cotton concern of 1000



Exeter Manufacturing Company, Exeter, New Hampshire

Mr. Frank R. Goodale, assistant treasurer since August 1, 1921, has been clerk of the corporation, and was paymaster for 22 years, succeeding his father in 1899.

From the beginning, excellence of output has been an insistent aim of the company. Its career has been one of steadily increasing prosperity. The plant has been repeatedly enlarged and improved and is now in all respects almost ideal. The company has acquired sole control of the water power of Exeter, and this too has very recently been

looms and 40,000 spindles which are employed in making sheetings, shirtings and twills.

The present company officials as of June 1, 1921, are as follows: President, Henry W. Anderson; treasurer, Hervey Kent. Directors: Henry W. Anderson, Hervey Kent, Chas. A. Appleton, Henry W. Beal, Frank W. Taylor, and Frank R. Goodale.

The capital stock of \$162,500 and a total of assets amounting to \$1,055,233 on April 1st, 1921, is evidence of the sagacity and



Pittsfield Mills of Exeter Manufacturing Company, Pittsfield, New Hampshire

improved at considerable expense. The affiliated plant at Pittsfield is likewise a model of its class. efficiency of the managment of this interesting and successful venture now approaching its centennial.

LANETT COTTON MILLS

The Lanett Cotton Mills of Lanett, Alabama, and West Point, Georgia, two opposite towns on the Chatahoochee River, is one of a group of very successful cotton manufacturing organizations in the Southin which the progressive Boston selling house of Wellington, Sears & Company are largely interested. It was incorporated in Alabama on September 17, 1892. The name Lanett was presumably given to the Alabama town in honor of the Lanier family, who have long been prominent in the management of the local mills, including the Lanett Cotton Mills and West Point Mfg. Co., as well as the Lanett Bleachery & Dye Works. Lafayette Lanier was the first president of the Lanett Cotton Mills and his son, George H. Lanier, has for a number of years been general manager of the three properties mentioned.

The original mill located in Lanett, Alabama, about half a mile below the West Point, Georgia railroad station, was started in 1893 and began to operate in July, 1894. It was a handsome four story structure, 125 feet wide and 400 feet long. The first yard of cloth woven in this mill was a piece of drill, which may be seen today in a frame on the wall of the superintendent's office, bearing the name of the original officers of the corporation, "L. Lanier, president, F. B. Sears, treasurer, and E. Lang, superintend-During the early years the product was wholly drills, but later, sheetings, shirtings and duck were given special attention. In 1902 a duplicate mill was built on a line with No. 1, only 20 feet separating the two mills. Some years later the space was built in, the mills connected, so that the plant formed one large structure over 800 feet long, 125 feet wide and four stories high. The Lanett has since added a big weave shed at one end of the original plant.

For some years the Lanett Cotton Mills had about 25,000 spindles and 600 looms, but during the first decade of operation the spinning and weaving machinery was doubled, and in the last twenty years additional machinery has been continually installed to meet the requirements of the expanding business of the company. Today the Lanett Cotton Mills has 83,000 spindles and more than 2400 looms. The company has an annual production of 10,000,000 pounds of cloth and employs some 1500 people. The capital stock has been increased from \$500,000 to \$1,000,000.

Lafayette Lanier, the first president, occupied this position for some twenty years, being succeeded by William H. Wellington, senior member of the firm of Wellington, Sears & Company, successors in 1901 to N. Boynton & Company, the original selling agents for Lanett products. Mr. Wellington has been president since the death of Mr. Lanier. One of the present directors of the Lanett is named for the first Lafayette Lanier. The first treasurer, Francis B. Sears, a prominent Boston banker, continued in that position until his death in 1914, when he was succeeded by his son, F. B. Sears, Jr., the present treasurer. The directors of the Lanett Cotton Mills are now Wm. H. Wellington, Francis B. Sears, George H. Lanier, Lafayette Lanier, Edmund H. Sears, R. P. Snelling, Harry L. Bailey, Preston B. Keith, and Walter H. Holbrook. R. W. Jennings has been superintendent of the Lanett for a number of years.

With the manufacturing end of the business under the capable direction of the Laniers, especially while George H. Lanier has been at the helm, and the merchandising of the mill's products ably taken care of, first by N. Boynton & Company and since 1901 by Wellington, Sears & Company, the Lanett Cotton Mills has been consistently prosperous. For twenty years, beginning with 1895, dividends averaged seven per cent annually, and since 1915, they have averaged over thirteen and one-half per cent. The company's most recent financial statement shows real estate and machinery valued at close to \$3,500,000 and a surplus of quick assets equivalent to more than

ninety dollars per share. The Lanett Cotton Mills management has given considerable attention to the matter of properly housing and otherwise looking after the welfare of its employees. It has helped to provide schools, churches and a library for the people of the town and generously contributes toward the support of these and other local institutions. It owns the town's electric lighting plant and several hundred cottages that are always kept in good condition. In a word, the Lanett by maintaining a very prosperous manufacturing business and carrying out a wise and generous policy towards the town and its people has made of Lanett one of the model mill villages of the South.

KALTENBACH & STEPHENS, INC.

Of all the narrow width ribbons produced in the United States forty per cent comes from the mills at Allentown, Pa., of one concern—Kaltenbach & Stephens, Inc., of Newark, N. J., which, it is asserted, is by far the largest single producer of narrow ribbons in the world.

The business was founded twenty-eight years ago by E. J. Kaltenbach and James B. Stephens, and on September 1, 1916, after this long partnership it was incorporated under its present name. Mr. Kaltenbach and Mr. Stephens made their first plunge in New York City, with some old

ten per cent is exported to other countries. Their specialties are narrow satins and Jacquards, hat bands and silk shoe laces. The volume of business has had a steady increase, employing between 900 and 1,000 persons. It is capitalized at \$2,500,000, and its officers are:

President, Charles E. Kaltenbach; vicepresident, Mrs. James B. Stephens; vicepresident, John C. Eisele; vice-president, Mrs. E. J. Kaltenbach; treasurer, Thomas F. Vietor; assistant treasurer, Thomas M. Scheidler; and secretary, Henry J. Kaltenbach.



Mills of Kaltenbach & Stephens, Inc., Allentown, Pennsylvania

German looms for equipment. They did considerable experimenting and finally it was decided to specialize only on narrow silk ribbon fabrics. Through all the years that followed and up to the present there has been no deviation from this policy.

Mr. Stephens died in October, 1918, and Mr. Kaltenbach died in June, 1919. Before they passed on the company had moved to Newark, N. J., and Allentown, Pa., and the business they left to their successors was both large and profitable, as indicated by the present turnover of about \$5,000,000. Kaltenbach & Stephens goods are sold throughout the United States and about

As will be noted, two of the executives are women—the widows of the founders. They take an active part in the management and a personal pride in the business itself.

As paramount factors in their success Kaltenbach & Stephens give the credit to the standardization of their product and the completing of all stages of production in their own plants, from the raw product to the finished fabric. Their aim has always been maximum production as consistent with good quality. Nothing shoddy or otherwise defective is permitted to leave their factories.

WAMSUTTA MILLS

At a time when the chief thought in the business life of New Bedford was the capture of whales and the fitting out of whale ships, the Wamsutta Mills were established. This plant had a romantic beginning. Dwight Perry, a Fairhaven man, back in the forties was operating a small cotton mill in one of the Southern States. Another Fair-haven young man, Thomas Bennett, Jr., who was employed in this mill, possibly had the foresight to think of the great future which the cotton industry of America had before it, and at the same time wanted to be at the head of a business of his own. He did not have enough capital to embark on such an enterprise alone and so he came to New Bedford, a neighboring town to Fairhaven, where he hoped to raise the funds. At that time Joseph Grinnell was a member of Congress and of considerable influence, so he was asked to give his support to the venture. At first, he favored the South as a location. Considering the plan, however, he felt that New Bedford was a desirable spot for this mill, so suggested it, and in fact insisted that it should be located there if he was to be expected to further the project by a substantial subscription for stock.

The real work then began in securing these subscriptions, although the amount desired was only \$160,000. It was uphill work as New Bedford knew more about the whale fishing industry than the cotton industry. Fall River was coming into prominence as a cotton manufacturing city, but in New Bedford the idea was an innovation. The money was finally raised, however, largely in small amounts, apparently to help the project along out of friendship for its promoters. Those who subscribed the largest amounts included Gideon Howland, Sylvia Ann Howland, Thomas Mandell, Ward M. Parker, David R. Greene, Latham Cross, and Grinnell, Minturn & Co., of New York. Most of the prominent men of New Bedford subscribed, but in rare cases only, for more than ten shares. The largest individual subscription was 150 shares. Edward L. Baker is mentioned as a highly successful solicitor and to his efforts is largely due the establishment of the mills April 8, 1846, the

Massachusetts legislature granted a charter to the corporation. Matthew Luce, Jireh Perry and Thomas S. Hathaway, were named as incorporators. Later the organization was as follows: President, Joseph Grinnell; treasurer, Edward L. Baker. Directors—Joseph Grinnell, David R. Greene, Thomas Mandell, Joseph C. Delano and Pardon Tillinghast. Thomas Bennett., Jr., was elected superintendent, and later became also the agent. With four big mills under his charge he laid a solid foundation for the success of the corporation. He remained with the company until 1874.

Operation began in 1848 and the first cloth was produced in February, 1849. When this was done, 15,000 spindles and 200 looms were in operation. In 1854 an enlargement was necessary, and another four-story building 240 by 70 feet, containing an attic, and equipped with 16,000 spindles and 300 looms was erected. "Harper's Statistical Gazeteer of the World" for 1855 mentions the Wamsutta Mills as one of the most important manufactories of New Bedford that "turns out daily 4,800 yards of cotton cloth, which has obtained several medals for its superior quality." In 1860 a third mill was built, with the equipment equalling that of the second. This made three mills with 47,000 spindles, in those days an enormous establishment. People marvelled at the fact, wondering if it were wise to continue such a business, but in 1868, mill No. 4 was begun, to operate 38,-000 spindles and 1,100 looms. In 1875 No. 5 mill was built, accommodating 50,000 spindles and 1,000 looms. In [88] and 1882 No. 6 mill was constructed, containing 51,000 spindles and 1,072 looms. This brought the total number of spindles up to 186,000 and the looms to nearly 4,000.

Later the equipment was increased to 4,316 looms and 239,000 spindles. Two thousand two hundred hands are employed. During 1920 the Wamsutta increased the authorized capital from \$3,000,000 to \$4,000,000 with considerable plant improvement in prospect. Within the last few years, in fact, approximately \$2,000,000 has been put into new equipment and repairs of

various kinds. Nearly three-fourths of the 4,316 looms have been replaced by new machines, including 2,000 Draper looms. The plant, now comprising eight mills, has been equipped with transformers and electric drives.

Wamsutta shirtings and sheetings have maintained high quality from the outset, and particularly during the Civil War kept up the standard of excellence. The fabrics produced during that period, when profit would have been easy without manufacturing goods of a high standard, made "Wamsutta" a household word practically throughout every civilized portion of the world.

The new sheet and pillow case department, established in the spring of 1921, was first carried on in a building formerly used for waste storage. In the summer of 1921 a brick building at the corner of Purchase and Hazard streets was converted into a factory giving more floor space, 16,392 square feet in all, nearly four times as much

as formerly.

P. R. Irvine, formerly with a bleachery in Wappinger's Falls, N. Y., is superintendent of the sheet factory. Mr. Irvine had made Wamsutta sheets before he went to Wappinger's Falls, having been employed for seventeen years by a firm at Port Chester, N. Y., which at that time had charge of the making and marketing of Wamsutta sheetings. He brought with him from Wappinger's Falls four experienced sheet and pillow case girls and three men who have charge of the tearing of the cloth and other specialized work. With this as a nucleus the organization has expanded to 125 sewing machines, including the hemstitchers. Some 15,000 pillow cases and 7,000 sheets are turned out each week.

At the Wamsutta Mills each bale of cotton undergoes severe tests and inspections. A high grade of cotton known in the market as "benders" is used, the name arising from the fact that it grows in the bends of the Mississippi River, famous for rich soil and production of especially strong fibre. The Wamsutta sheets are made up of the Wamsutta Percales, strong thread, and New Bedford qualities. The Wamsutta sheets and pillow cases are the highest priced and of the best grade. Heads of sheeting departments in large retail stores of the country

say that the women of the country know that the name Wamsutta stands for quality.

In addition to its successful efforts to manufacture an excellent product, the management has an eye to the well-being of its employees. A recreation room and cafeteria, opened in the spring of 1921, offer unusual facilities. The recreation room is large enough to accommodate at least 500. The building containing these rooms is also used for meetings at other times. It is provided with a large motion picture screen, of cloth manufactured by the mill itself. Cinema exhibitions, either of practical work of the mill or of recreational subjects are shown. Basket-ball equipment is also installed.

The Wamsutta is a wonderful plant. The 239,000 spindles could not be replaced today for less than nine or ten million dollars. The company is under progressive and up-to-date management, and with its sheetings and other well-known products, very profitably merchandised, as they are.

it has a bright future.

The original capitalization of \$150,000 has been increased eight times. In 1849 it became \$300,000; in 1853, \$570,000; in 1855, \$600,000; in 1860, \$1,000,000; in 1868, \$2,000,000; in 1875, \$2,500,000; in 1882, \$3,000,000; and in 1920.

\$4,000,000.

Joseph Grinnell, the first president, was a conscientious, capable man, serving until his death February 7, 1885. The officers at the present time are as follows: Oliver Prescott, president; C. F. Broughton, treasurer; Arthur L. Emery, agent; George E. Rycroft, assistant treasurer; H. C. French, purchasing agent; George N. Haskell, clerk. The directors are William W. Crapo, Otis S. Cook, Horatio Hathaway, Jr., Oliver Prescott, William R. West and C. F. Broughton. The late Francis A. Foster was a director for several years until his death in 1921.

Besides bleached and brown sheetings and shirtings, the product includes lawns, fancies, sateens, poplins, oxfords and highgrade yarns. Until recently the Wamsutta gray goods product has been sold direct, but now practically all Wamsutta goods, finished and gray, are merchandised by Ridley Watts & Company, New York. Yarns are sold direct and through R. A. Blythe,

Inc., Philadelphia.

JULIUS KAYSER & CO.

Julius Kayser was the originator of the famous Kayser silk glove. On this glove was founded the largest business in the world today selling direct to the retail trade,



THE LATE JULIUS KAYSER

with its s'xteen factories, 7500 employees, and capitalization, at the time of Mr. Kayser's death, in March, 1920, of \$15,000,000. The manufacture of the product began shortly after he came to this country in the early seventies in a little frame shack at 66



E. S. BAYER President of Julius Kayser & Company

Mercer Street, New York City. The gloves immediately pleased the fancy, fitted well, and proved their wearing qualities, and orders came in by leaps and bounds. Mr. Kayser then introduced his double finger tip glove, the first of many radical innova-

tions which he patented.

To inject the Kayser quality still further into the gloves, Mr. Kayser acquired a control of every process entering into their manufacture, from the importation of the raw silk to the sale of the finished article. He also adopted a new merchandising policy, offering goods at one price, regardless of the size of the order, with no discount, and all trade-marked with the name of the factory, and bearing an iron-clad guarantee straight through to the wearer.

While the echoes of the praise of the Kayser silk glove were resounding in several countries, Mr. Kayser's keen commercial mind coupled with a desire to make a better garment, saw the opportunity for the improvement of ladies' underwear. Mr. Kayser recognized the need of educating women to



Factories of Julius Kayser & Company

the fact that silken under-garments were not luxuries, but economies; that they wore longer, laundered easily, were pleasing to the touch, and the material permitted of more beautiful effects than any other. The "Italian" underwear which he began to manufacture became as much of a success as the Kayser silk glove. Silk hosiery and knit underwear, with improvements, were soon added and became well-known products of the company.

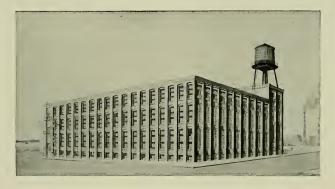
Today, these products are standard the world over. Every process of manufacture is supervised to insure it. All raw materials are tested in a laboratory, each operation is directed by technical experts, and research chemists are constantly seeking methods of improvement. The company was incorporated in 1906 and the present officers are E. S. Bayer, president; W. A. Shakman, vice-president and general manager; L. L. Lewinsohn, vice-president and treasurer,

and C. W. Sinn, secretary.

LOWELL BLEACHERY

With its finished goods going to all parts of the United States as well as to South America, Africa, and of late an increasing quantity to Europe, the Lowell Bleachery has an international reputation. This reputation has been built up by intelligent and progressive management during a period of nearly ninety years. Established in 1833 in Lowell, Mass., when the development of the cotton manufacturing industry there made a bleachery in the vicinity practically a necessity, its business rapidly grew, first with markets in the United States outside of Lowell and subsequently with foreign countries. The Bleachery was incorporated in the year mentioned by a special act of the

John Clark and James C. Dunn. Charles T. Appleton was treasurer twenty-five years and from a small beginning the plant grew under his management to be a strong and prosperous concern. Previously, Mr. Appleton had been in charge at the Waltham Bleachery and acted as both agent and treasurer for a number of years when he first came to Lowell. Later Charles A. Babcock and Fred T. Appleton acted as agents. Mr. Snelling's successors were Percival Lowell, Harcourt Amory, Eliot C. Clarke, Philip Stockton, Edward Lovering, and Sidney Coolidge. Mr. Coolidge has been treasurer since 1904. His predecessors since Mr. Snelling served short terms except Mr.



New Building at St. Louis Branch of Lowell Bleachery

General Court of Massachusetts. The original capital was \$25,000, increased from time to time, so that it is now \$800,000.

The founders of the company were Ebenezer Hobbs, Jr., John Avery, Jonathan Derby, John Clark, Augustus H. Fiske, and Isaac Fiske. John Avery was president from 1835 to 1864, Augustus Lowell from 1881 to 1896, with the exception of a few months in 1882 and 1896, when William S. Dexter and Harrison Gardner acted for him. George F. Richardson was president from 1900 to 1907. Edward Lovering was president in the four years before Charles P. Curtis, who became president in 1911 and served until 1920, with the exception of one year when the place was filled by Francis J. Moors, the present incumbent, who was again chosen in the latter year. There were only two treasurers of the Bleachery for about fifty years, from 1835 to 1886. These men were Charles T. Appleton and Samuel G. Snelling. Before 1835, the treasurers had been

Clarke, who held the position from 1889 to 1900.

The present officers of the company are as follows: President, Francis J. Moors; vice-president, Hugh McK. Jones; clerk, Frederic A. Fisher; treasurer, Sidney Coolidge; agent, Howard L. Whiteley; general superintendent, P. W. Kiernan. Directors, beside Messrs. Moors, Jones, Fisher, and Coolidge, are Edward Lovering, Charles P. Curtis, and Charles S. Shepard.

The Company specializes in finishing cambrics, nainsooks, khakis, towels, pocketings, etc. In recent years extensive business has necessitated enlarging the Lowell plant, whose annual turnover is more than 18,000,000 pounds. In 1913 a small branch was started at St. Louis in a hired building. Business increased so that in 1917 the Company occupied its own modern plant. Business amounted to nearly 4,000,000 pounds in 1920. A large addition recently erected affords facilities for a still larger business.

CHAS. T. MAIN

WELL KNOWN INDUSTRIAL ENGINEER AND EXPERT ON POWER PLANTS, OF BOSTON

The part of the industrial engineer today is certain to be a more important one than ever before. He is confronted with problems of the first magnitude, on the solution of which must depend to a large extent the



CHARLES T. MAIN

immediate future of American business. Now that we again face world competition upon the most intensive scale it is of pressing moment that we find ways to do things economically and efficiently. And they must be done in a big way—bigger than we have heretofore attempted. Happily there is every assurance that the good work will

go rapidly forward. If any proof were needed it would be only necessary to cite the demand for industrial engineering talent of the first calibre. This demand is urgent and arises on all sides. New building programs are being formulated in many industries, and we may expect to see an early beginning of important operations.

Among the well known industrial engineers of the country the name of Charles T. Main, Boston, is a familiar one. Mr. Main has done some very interesting things in his field, having had a hand in the evolution of numerous large enterprises. His business is organized to do engineering work for all kinds of industries, including textile mills and other industrial plants, storage and terminal facilities, water power and steam power developments, and the examination and reports on plants with reference to their value, reorganization or development. Associated with Mr. Main are Fred B. Cole, F. M. Gunby, H. E. Sawtell, J. F. Osborn, W. F. Uhl, Charles R. Main, and A. W. Benoit.

Mr. Main is a native of Marblehead, Mass., where he was born February 16, 1856, the son of Thomas and Cordelia Reed Main. His father was a native of Marblehead, and his mother came from Plymouth. Both were members of old American families, established in colonial days.

The education of Mr. Main began in the public schools of Marblehead and continued at Massachusetts Institute of Technology, from which he was graduated in 1876 with the degree of B.S., from the department of mechanical engineering. Mr. Main remained at the Institute as an assistant in that department for three years. In the fall of 1879, he went to the Manchester Mills, Manchester, N. H., as draftsman. He was connected with this organization for a little more

than a year, leaving on January 1, 1881, to become engineer of the Lower Pacific Mills, Lawrence, Mass. This was an executive position of considerable responsibility and gave to Mr. Main the opportunity of demonstrating what he could do. That results were satisfactory was indicated by his promotion in March, 1886, to be assistant superintendent, and in July, 1887, to the superintendency of the mill. He also retained control of all engineering work.

During a period of eleven years Mr. Main directed the reorganization and rebuilding of the Pacific Mills plant, and for more than five years had charge of the operation of the mills. At the end of this time he decided that he would retire from administrative work and confine himself more strictly to engineering, where his inclinations led him, a change which he had been contemplating for a long time. So he left the Pacific Mills, and after one year in Providence, R. I., spent in engineering and mill work of a miscellaneous character, he formed an association with F. W. Dean, conducting a business as Dean & Main, devoted largely to textile mill work. Gradually this was broadened so as to include other industrial plants. This association existed from January, 1893, to January, 1907, when Mr. Main embarked independently. He has since conducted his business under the name of Charles T. Main.

From 1893 to the present time a large number of industrial plants have been designed and constructed or reorganized under

his direction.

Among the largest undertakings in the group of industrial plants are the Wood Worsted and Ayer Mills in Lawrence, Mass., the Ludlow Manufacturing Associates, Ludlow, Mass., the Passaic Cotton Mills, Passaic, N. J., the Dwight Manufacturing Company, Chicopee, Mass., and many other well known leading textile concerns, as well as the Gillette Safety Razor Company, Lever Bros. Company, and the American Sugar

Refining Company, a complete refinery at Baltimore, Md.

In the hydro-electric field, the work has included developments for the Montana Power Company, aggregating about 250,-000 H. P.

Appraisal of textile and other properties is another important part of the work of the organization. Another important part of the work and the list of clients for whom this has been done includes some of the largest

concerns in the country.

Mr. Main has served as consulting engineer of many projects and as expert witness or referee in important legal actions. He has written a large number of papers on engineering subjects. He has taken an interest in public affairs, and has held several municipal offices. For three years he was an alderman of Lawrence, and for eleven years on the water and sewer board at Winchester. He has also been a member of the board of trustees of the public library, and of the school committee in Lawrence.

Mr. Main is a member of the American Society of Mechanical Engineers, was a manager of the organization for three years, and president in 1918. He is also a member of the American Society of Civil Engineers, the American Institute of Consulting Engineers, Boston Society of Civil Engineers (past president), and of other technical societies. He is president of the Engineers Club in Boston, and a life member of the Corporation of the Massachusetts Institute of Technology. He has been a frequent contributor to the technical press and a speaker at many professional gatherings, on engineering topics.

He is a director of the Massachusetts Trust Co., Tennessee Eastern Electric Co., Berkshire Cotton Mfg. Co., and trustee of

the Winchester Savings Bank.

The Engineers and Exchange Clubs, Boston; The Engineers' Club, New York; and Calumet and Winchester Country Club, Winchester, include Mr. Main in their membership.

SUSQUEHANNA SILK MILLS

Manufacturing and selling the right merchandise at the right time at the right price is the common sense principle which the Susquehanna Silk Mills have steadfastly pursued since their establishment in 1896. The accomplishment of results as good or even better than the best foreign or domestic standards has been their aim. "A square deal to stockholders, employees and the public" has been their religion. A steady growth, with never a backward step, and great financial prosperity has been the reward of an admirable general business policy built along the lines here indicated.

The Susquehanna Silk Mills manufacture broad silks and their specialties are piece dye all-silk, silk and wool, and silk and cotton mixtures. These goods are produced in the Company's various plants in Pennsylvania and Ohio and sold through headquarters, 149 Madison avenue, New York City, and representatives throughout the United States and its territories and possessions. With an authorized capital of \$2,500,000 preferred stock (\$500,000 common) and a working organization of 5,000 the Susquehanna Silk Mills do a business representing an annual turnover of over \$20,000,000.

H. Schniewind, Jr., Max Siepermann and their associates who founded this thriving organization at Sunbury, Pennsylvania, laid their plans carefully, their main consideration being to locate the business in the

world's largest center of silk goods consumption and of the raw silk trade, and after all these years Mr. Schniewind, who is the president of the Company, and his copartners have failed to discover that any early mistakes of judgment have retarded the development of the enterprise; there are no past calamities to bemoan, no lugubrious

might-have-beens.

The Company's central mills are at Sunbury, producing broad, dress, lining, tie and printed goods. Here there are 700 employees and 800 looms. There are branch mills at Huntingdon, producing plain broad, dress, tie, lining and printed silks and upholstery; Jersey Shore, producing broad, dress, tie, lining and printed silks, handkerchiefs and upholstery goods; Lewiston, producing the same; Milton, with the same production and also thrown silks; Northumberland, broad silks and winding, and Marion, Ohio, where broad, tie, lining and printed silks, handkerchiefs and upholstery goods are also manufactured, while at Sunbury, Pennsylvania, is the Sunbury Converting Works, producing dye, bleach, print and finish silk and silk mixed goods for the Company's own use. The majority of the employees in all plants are Americans.

Benjamin Hurd is vice-president and secretary of the Susquehanna Silk Mills; E. H. Schniewind, vice-president; August Heinzemann, vice-president; and J. E. Fox,

treasurer.

NEW ENGLAND WASTE CO.

In that portion of this book dealing with the development of modern cotton manufacturing, much importance is attached to methods in vogue for the trading in and disposition of the huge quantities of cotton byproducts which accumulate in the cotton mills, and are commercially known as cotton waste. As the cotton is being carded and combed into yarn there is thrown off from the machines the fibres which are not exactly suitable for use in making that particular product which is the final object of the processes mentioned. But these so-called wastes are valuable as raw material for the production of other products, as noted in the chapter devoted to textile substitutes.

One of the leading organizations devoted to cotton waste is the New England Waste

The uniform high quality of the packing of the New England Waste Company has ever been the foundation of this organization's successful growth. Naturally, such a policy can be adhered to only by an organization which has the facilities and equipment necessary to resort and repack every pound of waste handled which should require such service. The plant has a staff of executives and overseers who are undisputed experts in their lines and energetic supervision is maintained at all times over all the departments. Stock is packed to meet not only the requirements of the generally standard specifications of the trade, but also those of individual customers whose needs run along special lines.



Plant of the New England Waste Company, Revere, Massachusetts

Company, organized in 1910, whose executive and accounting offices are at 549 Atlantic Avenue, Boston, Mass., and warehouse and packing plant located within a few miles at Revere, Mass.

The plant at Revere is considered by experts to be one of the largest and most modern in the country, devoted to the handling of cotton waste. The company offers an efficient service to the cotton mills in New England, and purchases the waste outputs from numerous customers in Fall River, New Bedford, Manchester, Lowell, and in the cotton manufacturing centers of Rhode Island. Purchases of waste from all these districts are shipped to the Company's plant at Revere, there to be sorted and packed according to the rigid specifications which have contributed to the high reputation of the Company's standards of packing.

The New England Waste Company is a leading factor not only in the domestic cotton waste trade, but is also recognized as one of the prominent operators in the export trade. The Company maintains close affiliations with successful cotton waste organizations in Europe and at such times as trade conditions render the export business practicable, large volumes of waste are routed into foreign channels by this Company. Being near Boston, the Company is ideally situated both close to New England mills, the source of supply, and on a harbor with facilities for engaging in foreign trade.

The Company is capitalized at \$1,000,000. About 200 persons are employed. The officers are as follows: President, Albert Greene Duncan; treasurer, Adolph Leve; secretary, George P. Rowell. Directors: David A. Ellis and Arthur W. Wood.

CHAS. J. WEBB SONS CO.

Though Philadelphia's textile establishments are many, none among the wool commission and cotton yarn houses has done more to put the Quaker City on the textile map than the firm of Charles J. Webb Sons

stocks, bigger buildings, and more helpers, were required to meet the growing business.

The accompanying illustration of the firm's Delaware avenue and Walnut street warehouses visually witnesses to the huge



Warehouses of Chas. J. Webb Sons Company, Philadelphia, Pennsylvania

Company. Their name and reputation have been carried far by energetic salesmanship and the good report of all who have dealt with them during the last thirty-seven years. In that time their resources have accumulated with great rapidity, beginning very modestly and increasing from year to year as larger

dimensions of the properties. There are two major divisions of the house, that which deals in wool, including tops and waste, and the department of combed and cotton yarns. Both branches of the business are conducted on a national scale; imports and special requirements for export are handled with the competence born of long experience; and the working force of 130 employees is predomi-

nantly American.

Charles J. Webb, to whose initiative was due the foundation of the great commercial structure bearing his name, was originally a native of Delaware, born at Wilmington, July 31st, 1858, the son of James Lamborn and Susan Rapp (Graeff) Webb, the first of English and the second of German extraction. The Webb family in America traces its beginning to Benjamin Webb, who settled on these shores in 1713. On the maternal side the record goes even further back, showing that George Marvis, a maternal forebear, was a member of the colonial assembly, 1684-88 and 1691-93, a provincial counsellor in 1695, and a justice of the peace, 1684-89 and 1691-93. Daniel Graeff, a great grandfather, was a captain of the army of the Revolution.

Mr. Webb's father was in the leather business. The son, who was one of a family of four children, attended the public schools of Burlington, New Jersey. At a very youthful age he was behind the counter of a grocery store acquiring the first principles of exchange, but the circumscribed opportunities of grocery clerking were so little to his liking that he was on his way to Philadelphia in 1873. Arriving on the scene of his future successes, when a mere lad of fifteen, he began a textile apprenticeship, so to describe it, in the employ of James G. Kitchen, who was a leading wool merchant of the period. Now, he himself, and his partners, are to be regarded as among the most progressive leaders of their profession.

Mr. Webb has achieved a place of distinction in the life of Philadelphia. The designation, prominent citizen, often used with little

reason, may be applied to him with full justification. He is one Philadelphian who

has assiduously striven to encourage all movements for the enhancement of the city's prestige and who believes in the ultimate regaining of her commercial supremacy. Though avoiding politics, he has consistently supported popular works for civic betterment.

Outdoor sports and the adventures of globe-trotting are Mr. Webb's chief relaxa-He is an enthusiastic golf player and a seasoned yachtsman, having been the first commodore of the Island Heights Yacht Club in 1898 and 1899. He has traveled around the world, through the Orient, and extensively over the United States.

Mr. Webb married Miss Mary Kate Spangler, daughter of Andrew M. and Mary M. Spangler, October 5th, 1882. They have three children, Edwin, Andrew Spangler,

and Herbert Keene Webb.

Mr. Webb was the leading spirit in the founding of the partnership of Charles J. Webb & Company in the '80's. Throughout the course of their business growth Mr. Webb has brought to bear his exceptionally broad knowledge of the essentials of wool and cotton yarn merchandising, added to which trained instincts were the qualities of an able executive. Associated with him today in the partnership are: John S. Whilldin, C. Edwin Webb, Andrew S. Webb, and Herbert K. Webb. These merchants in winning their present position, have simply "kept everlastingly at it," and this tending to their own business on a plane of reciprocal regard for the best interests of the industry has well proven its efficiency. To the favorite maxim of the commission men, "Sell and repeat," they, also, subscribe.

Charles J. Webb Sons Company's main offices are at 116-118 Chestnut street, Philadelphia. Branches of the house are located in New York, Boston and Chicago.

HOTCHKIN & CO.

The firm of Hotchkin & Co., for the last fourteen years located at 53 State St., Boston, is generally considered one of the largest and most active houses in the country, dealing strictly in unlisted securities; and it is largely due to the efforts of this concern that the New England textile stocks enjoy their present broad and active markets.

While specializing in all classes of high grade unlisted securities, this firm, about eight years ago, sensed the wonderful possibilities in New England manufacturing stocks which up to that time had been closely held, and although rated as excellent investments, were not easily traded in. One of the mcmbers of this firm, when interviewed by the writer, stated that when they first began to trade in mill stocks they found stockholders of each mill generally located in or about the immediate vicinity of the plant, and many times with only a vague idea of the true worth of their investment; estates which were forced to liquidate such securities found it extremely difficult at times to realize anything like intrinsic values for their holdings, with the result that the average investor was cautious in making any considerable investment in this class of securities, doubting whether he could readily realize on them in case a necessity arose.

Today probably no one class of unlisted securities is better known or more actively traded in than the shares of these corporations. It is very probable that even in the more distant sections of the United States there is hardly a town of any importance in the country that cannot boast of a few stockholders having some holdings in the shares of our New England mill corporations. A large volume of transfers is taking place every day, and banks now accept mill stocks for collateral purposes almost as readily as they do many of the well known listed issues.

It is one of the policies of Hotchkin & Co. to keep in personal touch with the management and business situation of each mill stock in which they are interested, or may be actively trading in. A large amount of time and attention is devoted to keeping thoroughly in touch with the general textile situation and this information is carefully tabulated so that figures and other data concerning each individual mill stock is available to the prospective buyer.

A large percentage of our highest grade investments are to be found among the unlisted securities, a fact which does not seem to be generally appreciated, and a banking house willing and financially able to maintain a market on such securities fills a real and growing need of the investment public. The large and growing clientele of Hotchkin & Co. is the best evidence that the investment securities in which this house specializes have proven extremely satisfactory to their purchasers.

SAYLES FINISHING PLANTS, INC.

The history of the Sayles Finishing Plants, Inc., Saylesville, R. I., covers approximately three-quarters of a century. The big establishment, including both the Sayles Bleachery and the Glenlyon Dye Works, consisted at the outset of a few frame buildings known as the "Pimbley Print Works," on the site of the present "Upper Bleachery," on the Moshassuck River. In 1847 William F. Sayles bought the property at auction, at first equipping it to bleach shirtings and sheetings. Mr. Sayles had been previously associated with his father, Clark Savles, a prominent Pawtucket merchant, and his business training was of great value. From the time he left school until he was twenty-three he had been employed in a commercial house, so it is not surprising to learn that by 1848 he was bleaching about a ton of cloth daily and by 1854 approximately four tons. That year, the buildings, which had been enlarged, were burned down. Within ninety days, however, a substantial main brick building and a grey room building, now a part of the group constituting the nucleus of the "Upper Bleachery," were erected. From 1854 to 1861 the business forged rapidly ahead, Mr. Sayles winning country-wide reputation for bleaching and finishing cotton shirtings.

In the early years of the Civil War, however, cotton mills had extreme difficulty in obtaining cotton, due to the blockading of all southern ports, and the Sayesville Works were operated only intermittently. In the winter of 1863-1864 the Bleachery received few orders, but in the spring of 1864, activity in all trade increased, and the capacity of the Works was taxed to the limit. The Bleachery buildings were enlarged and additions and improvements made, comprising sixty-four feet to the main building, including the tower, an office building, and other improvements. These did not prove sufficient, however, and in August, 1868, another new building, the "Lower Bleachery," began operation. Previous to this time the product was only plain shirtings in various widths, up to forty-five inches, but in this building wide sheeting was manufactured. Some time after 1870 two tenter machines

were installed in the attic of the main building where the wide sheetings are now folded and packed. This was the beginning of the "White Goods" departments, now an important branch of the business.

During the early years Frederick Clark Sayles, a younger brother of W. F. Sayles, had worked in the Bleachery, and after 1863 the business was conducted for a number of years under the style of W. F. & F. C. Sayles. The firm established the Lorraine Mills and the Glenlyon Dye Works were built to dye and finish their product. William Sayles died in 1894 and on the retirement of F. C. Sayles, Frank A. Sayles, son of William, inherited the business. In 1900 Frank A. Sayles purchased the Phillipsdale property, at that time only partially built. It was soon completed and gradually developed into its enlarged and efficient condition. Here the processing of cottons are carried on.

The present magnitude of the plant is a great contrast to the initial size. Some of the old records show that from 1854 to 1860 there were only about a dozen names on the bleach house pay roll, requiring about \$150 to \$200 per month. Up to 1861 the maximum number employed was fifty, calling for \$1,500 monthly disbursement. In 1890 the two plants employed nearly 800. The expansion of the business can be readily seen from another point of view. In 1860 the weekly output was 500,000 yards a week, and in 1890 the concern was processing about 1,800,000 yards of cloth in the same time. The present monthly production capacity is 25,000,000 yards of bleached goods, 5,000,000 yards of dyed goods, 5,000,000 vards of print goods and 250,000 pounds of dyed yarn. This is a wonderful develop-

Charles O. Read, the president of the Sayles Finishing Plants, has been with the Company since 1863, nearly 60 years. Of all the people who were associated with him in the eventful years from 1863 to 1870, not one is now living. The other officers include Kenneth F. Wood, first vice-president and treasurer; John W. Manley, second vice-president; and Ethelbert Harman, secretary and assistant treasurer.

LOUIS LOWINSON

72 LEONARD STREET, NEW YORK CITY

Mr. Louis Lowinson, head of the firm of Louis Lowinson & Co., has been engaged in the cotton goods brokerage business since he left the public schools of New York City in 1888. Immediately before starting his present organization he was a member of the firm of C. H. Pope & Co., which dissolved in November, 1912. Since that date and until January 1, 1920, he conducted the business as an individual. On January 1, 1920, he took into partnership with him, Messrs, Gustave R. Lewinson, John J.



LOUIS LOWINSON

Bruckner and Sidney H. Scheuer, who have been with him for many years, and who have done much towards establishing this brokerage office as one, the standing of which is of the highest. Mr. Lowinson is known to practically everybody in the dry goods market, and many interesting anecdotes descriptive of his office boy days are told by the older factors.

Many of his contemporaries have acknowledged his valuable contributions to the betterment of trade conditions, and he is constantly being consulted on trade matters, especially by the younger brokerage organizations, converters and manufacturers, who

seek his advice and guidance in matters pertaining to the industry.

The financial and moral reputation of this concern is of the highest and there never has been an instance where their standing has been questioned.

The largest portion of the business done is domestic. The products handled are grey cotton fabrics of all kinds, ranging from to-bacco cloths to the finest combed yarn fabrics. Silk and cotton mixtures and fancies are also dealt in to a considerable degree. There is a specialist in charge of each of the various lines handled which, of course, makes for well rounded organization.

A portion of the product of practically every mill in Fall River, New Bedford and the Near East is sold through this office, also much of the product of the various southern mills which are represented by commission houses in New York.

The volume of merchandise passing through this organization amounts into the millions annually. Among the clients of this concern are numbered practically all of the most prominent merchants of grey cotton goods in the United States.

One of the rigid policies of the house is to do business with those concerns only in whom they themselves have absolute confidence as to their integrity and standing. This proves of great value to the mills inasmuch as carelessness in this regard often results in financial loss.

The business has been developed largely on the basis of individual service of the most intelligent character, and close cooperation with both mills and buyers in watching their particular needs and requirements. Mr. Lowinson has been a leader in the matter of modernization and has been the first to devise and use many methods, which have made for the more efficient handling of the business. Direct lines of communication are installed connecting the principal clients and out of town offices, thereby facilitating the rapid consummation of trades. In a rising and erratic market of the past few years, this has been particularly valuable to both sellers and buyers.

The nature of the brokerage business permits of irregular practices of a most dangerous character. This concern has been ever watchful to guard against any dangerous infringements and their success is credited largely to a rigid and well defined code of

ethics from which they never deviate. This, of course, has resulted in the cementing of their connections with both mills and buyers.

Mr. Lowinson is the originator of the copyrighted "Comparative Cotton Goods Chart," which is the only chart of its kind in circulation. It is issued gratuitously each January to all concerns who are interested in cotton and cotton goods. The chart, which serves as an index to market fluctuations of previous years, is to be found throughout the entire industry in this country and in many foreign countries. Requests for it have been received from as far away as England and India. It is used as reference work for the trade in general, and many of the United States Government Departments.

Mr. Lowinson's comprehensive telegraph code for cotton goods is another well appreciated publication. It is used by the out of town clients of the house whenever privacy and economy is desired. Mr. Lowinson's public statements have always been timely and of a constructive character. He has written some interesting and valuable articles which have appeared in the trade journals and newspapers from time to time.

In recent years a large number of brokerage houses have sprung up and some of the old time houses have expanded. Throughout this period it has been necessary to steer a careful course, and to avoid loose methods. This has been done successfully by the Lowinson organization which is attested to by the continuous volume of business which is handled by them. In the last analysis, real success in textile brokerage business is indicated by the opinion of competitors, mills and clients.

From all that is to be learned, Mr. Lowinson and the firm of Louis Lowinson & Co. can refer with pride to all those with whom they have had dealings.

THE SEYDEL MANUFACTURING CO.

Hermann Seydel and Paul Seydel established The Seydel Manufacturing Company, at Atlanta, Ga., in 1904 to supply the textile industry with something of which it was sorely in need—a real sizing that would help in the development of automatic weaving. They called their product "Sizol." Coming North they established a plant at Jersey City, N. J. Capitalized at \$1,000,000, they sell their Sizol Specialties for the sizing of warps and the finishing of textiles throughout the United States and in Mexico, Great Britain and continental Europe. Within the last few months the Sevdel Manufacturing Company and the Nitro Products Company, of Nitro, West Virginia, merged their interests, retaining the name of the former Company.

Most Sizol compounds are made through mixing three groups of materials which can be classed roughly as gums, fats and chemicals. The gum group gives the fabric the right body; the fats so penetrate it as to make it pliable and the chemicals preserve the goods in a normal state of humidity. While efficient weaving is the guiding principle in the manufacture of Sizol, the problems of the dyer, bleacher and finisher are

all taken into account and so successfully met that in all the years of Seydel service there has been no complaint from these There have been no changes in the basic proportions and the chemical prop-erties of Sizol "C" since it was first made in 1904, but in order to meet the varied demands of the weaving industries, many other Sizols have since been compounded. Sizol keeps the size from sticking to or fouling the slasher cylinders; it does not affect the most delicate after-finish; it makes a clear size, thus being admirably adapted for colored and mercerized work, the "knocking down" of either color or lustre being reduced to a minimum, and it imparts and preserves that full, open, clothy feel desired of most textile fabrics. For cloths shipped overseas and exposed to long travel and exposure it is indispensable.

Herman Seydel is president, Paul Seydel and Frank C. Pitcher, vice-presidents; and J. B. Pitcher, formerly president of the Nitro Products Company, is secretary and treasurer of The Seydel Manufacturing Company as now merged with the Nitro Products Company. Their business rules are "Sizol Service" and "Fair Dealing with Cus-

tomers.

D. L. GOFF-D. GOFF & SONS

The family of Darius L. Goff is one honored in the annals of New England textiling. He himself has been responsible for the later phases in a continuity of enterprise traceable to a period antedating the Revolution and developing as it went along significant industries born of the zeal of pioneers. Events of decisive effect upon textile history transpired from the mills of the Goffs, and the record throughout attests to the constructiveness, perseverance and forsightedness of its makers. D. Goff & Sons of Pawtucket, R. I., is one of the industrial bulwarks of that thriving textile center and a representative mill of the first class in New England. To follow the vicissitudes passed through by D. L. Goff's was built on the Blackstone River to replace the primitive structure dating from 1813 that had been previously occupied, and four years later the younger son of Darius Goff, Lyman B. Goff, was admitted to partnership. The incorporation of the firm at a capital of \$600,000 occurred in 1884, with Darius Goff as president and D. L. Goff, as treasurer.

An important change of policy was initiated by the Company in 1881 when they undertook to compete with English mills in the manufacture of mohair plush, and, though it had never before been made in America, the Goffs finally succeeded after determined effort in rivaling their overseas competitors, and so continued prosperously until 1905 when the line was superseded



Plant of D. Goff & Sons, Pawtucket, Rhode Island

father, Darius Goff, who lived a span of eighty-two years (1809-1891) devoted to experiment and achievement in manufacturing and to filling the place of a distinguished citizen would provide material for a biography of length. Darius Lee Goff was the eldest son, born at Rehoboth, Mass., March 20th, 1840. His mother, before her marriage, was Harriet Lee, daughter of Israel Lee, of Dighton, Mass. A student at Brown University, Providence, from 1858 to 1862, upon graduation he was immediately received into business partnership with his father. D. Goff & Sons succeeded in 1861 to the business of the American Worsted Company which had been first in America to manufacture worsted braids and yarns, an arrangement between Darius Goff, D. L. Goff, and W. F. and F. C. Sayles.

The new firm, favored by protective tariff, had in the manufacture of braids an industry compelled to growth by increasing demands. In 1872 a large brick mill

by other products. Next to be manufactured were serge and alpaca linings, in conjunction with a steadily maintained production of braids. The corporation manufacturers, in 1920, worsted, cotton, and silk fabrics, and considerable quantities of worsted yarn. The employees are about 900 in number.

D. L. Goff is the present head of D. Goff & Sons. His interests extend into other textile and business ventures. He is president of the Bridge Mill Power Company, the Royal Weaving Company and the Puritan Life Insurance Company, also director in the Union Wadding Company, Crown Manufacturing Company, and Pawtucket Haircloth Company. L. B. Goff is vice-president, and Darius Goff, son of D. L. Goff, treasurer of D. Goff & Sons.

D. L. Goff is one of Pawtucket's most highly esteemed citizens. Like his father, he has done much to promote civic progress and the general prosperity of the com-

munity.

PACIFIC MILLS

After their success in establishing the city of Lowell and, with Lawrence already in infancy, Abbott, William and Samuel Lawrence, John A. and Francis C. Lowell, Nathan Appleton, Patrick T. Jackson, and others laid plans for erecting the Pacific Mills in Lawrence in 1850. They incorporated for \$1,000,000 and built the largest mill in the world for manufacturing ladies' dress goods, including woolen, worsted, and cotton fabrics. The main building was 500 by 72 feet and six to eight stories high. Here 1000 looms were run and enough auxiliary machines to supply yarn and finish it off when woven. The second building was the print works, which has since become justly famous. The shop was 1000 feet long and three stories high.

growth. In 1862 it was \$2,500,000, and remained at that figure for almost forty years. In 1867 the aggregate sales were approximately \$8,000,000. At that time about 3,600 were employed.

The corporation did not acquire new property to any extent until 1909, when the plant of the Cocheco Manufacturing Company was purchased in Dover, N. H. This was the initial step in expansion externally and was of considerable material gain and advantage to the Company. The Pacific continued to operate the mills at Dover, N. H., but transferred the printing machinery to Lawrence. It was at this time that the Pacific Mills became the vanguard of the American print industry. Previous to its acquisition by the Pacific the Cocheco



Pacific Mills Cotton Department, Lawrence, Mass.

The immense size of the plant nearly overwhelmed the Company during the first decade or so. The low tariff was also an obstacle to its success. The financial depression of 1857 caused serious difficulties. Abbott Lawrence, the president, came to the rescue, however, and from his personal financial resources, supplied several hundred thousand dollars. The temporary disruption of the textile industry in this country by the Civil War in 1864 again brought anxious days. The Company weathered all the storms and distracting crises, however, gradually increasing in strength, until it is now a thoroughly successful concern. At the close of the Civil War, 3,500 looms were in operation and 100,000 cotton and 16,000 worsted spindles, besides eighteen printing machines. Today the plant covers 182 acres in floor space alone and operates 15,933 looms with 660,112 auxiliary cotton and worsted spindles and fifty printing machines.

The original capital was gradually more than doubled because of successful internal

Company had purchased part of the business of the Manchester Print Works. Then the Hamilton Print Works at Lowell was purchased by the Pacific in 1910. In each of these only machines, trade tickets and good will were purchased, but no real estate.

In the next few years, the Company devoted itself to building up its establishment in Lawrence to take care of its increasing business. The erection of an immense modern print works, the largest in the world, began in the summer of 1909 at South Lawrence, on an eighteen-acre tract. Other additions included a six-story worsted yarn mill and a big weave shed containing 1,250 worsted looms, together having sixteen acres of floor space, a new large store-house and a big power house. The company re-equipped the old Pacific Cotton Mill and improved the Cocheco Mills at Dover, N. H. Their own growing mills at Lawrence surrounded the Atlantic Mill, and this led to its purchase. This plant was bought for its situation and its waterpower. An important

purchase made a few years later, during the World War, was the printing business of the Merrimack Print works at Lowell. This was acquired advantageously and with its purchase came machinery and dyestuffs which were valuable, particularly at that time. The latest purchase consisted of four cotton mills

and all-wool dress goods. In the amount of manufactures of cotton warp and all-wool dress goods they are also unrivalled. Each year the finished goods—cotton, as well as cotton warp and all-wool fabrics put on the market by them—require the product of 28,500 looms, including their own.



Pacific Mills Worsted Department, Lawrence, Mass.

of the Hampton Group of the Parker Cotton Mills in Columbia, S. C. These mills are the Olympia, Granby, Capital City and Richland Mills. Their equipment included about 200,000 spindles and 5,000 looms, enabling the Pacific Mills to have available considerably more grey goods, necessary for its printing industry, than previously. Before the acquisition of these mills the concern made only about fifty per cent of the grey goods required for this purpose.

In 1912 the capitalization was increased to \$12,000,000; in 1917, it reached \$15,000,000, and recently \$20,000,000. The

Among the worsted and wool goods are complete lines of serges, panamas, challies, linings, batistes, brilliantines, crepes. In the cotton goods are organdies, voiles, taffetas, foulards, mulls, percales, poplins, galateas, cambric, shirtings, back and face napped flannels, cretonnes, scrims, etamines, velours and other draperies. The unrivalled output of bleached cotton goods from the new bleacheries with modern equipment includes wide varieties of twills, muslins, cambrics, nainscoks, drills, shoe linings and other fabrics.

The cotton department of the Pacific Mills, with six separate plants, has about



Pacific Mills Print Works, Lawrence, Mass.

popularity of their product of bleached, dyed and printed cotton cloth and cotton and wool and woolen dress goods has steadily increased to a maximum of \$72,000,000.

The Pacific Mills are today the largest manufacturers in the world of printed, dyed, and bleached cotton goods; cotton warp 540,000 spindles and nearly 12,500 looms engaged in manufacturing prints and fancy cottons. At the Lawrence plant the worsted department contains 3,710 looms, 92,464 worsted spindles, and 31,360 cotton spindles for combed cotton yarns. The immensity of the Pacific Mills can perhaps be better

appreciated by the following: If the 15,933 looms of the mills were placed end to end they would make a continuous line more than twenty-four miles in length. Electricity enough is generated every day to run the entire street lighting system of Boston and all other cities and towns within ten miles. The normal product of over 195,000

Mills. In 1837 a commission house was founded by Amos A. Lawrence, and Robert A. Mason which has sold the products of various textile mills, including the Cocheco Mfg. Co. Amos A. Lawrence, one of the partners, was a nephew of Abbott Lawrence, the first president of the Pacific Mills corporation.



Pacific Mills Cocheco Department, Dover, N. H.

acres of cotton (or about 70,000 bales) and wool from 2,366,400 sheep is woven each year or enough cloth made daily to reach from Boston to Philadelphia. Over 500 miles of cloth are finished and packed ready for shipment daily. The annual output of finished cloth would reach more than six times around the world. The print works can finish cloth at over a mile a minute.

In 1913 Lawrence & Co. opened a London office, to meet a world-wide market for Pacific goods, so successful, that they have organized a fully equipped special export department at their New York office.

They now have offices or agencies in most of the leading cities of the world where textile fabrics are sold. It is very interesting to note that Lawrence & Co., who, under the name of Amos and Abbott Lawrence, about



Pacific Mills, Columbia, S. C.

Every year except two, during the sixtyone years since dividends were inaugurated in 1859, the company has paid cash dividends. In 1882 and 1883 no dividends were paid. Those years the profits were expended on the plants.

For thirty-nine years, the house of Lawrence & Company, of Boston and New York, has acted as selling agent for the Pacific 100 years ago were the leading importers of textile fabrics from European countries, are today the leading exporters of textiles to practically every civilized country, and that the Pacific Mills products are now sold by leading retail establishments literally the world around, as they are so made and finished as to exactly suit the needs of every season and market.

GOODALL WORSTED CO.

The progress of the Goodall Worsted Company of Sanford, Maine, shows what can be accomplished by specialized creative endeavor. This Company was one of the pioneers to realize the opportunity in developing and exploiting lightweight fabric for summer and tropical wear.

The Company accordingly developed and marketed the now internationally known and justly famous "Palm Beach" cloth which at they are excellent. A complete line of mohair fabrics are manufactured, alpaca and worsted coat linings, drapery cloths, mohair dress goods, and upholstering cloth for the automobile and furniture trade.

The organization represents a capitalization of \$6,950,000. The equipment consists of twelve worsted cards, twenty-seven combing machines, 352 broad looms, 838 narrow looms, 27,024 worsted spindles, and twenty-eight boilers for the dyeing and fin-

HOME OF PALM BEACH CLOTH



GOODALL WORSTED COMPANY Sanford, Maine



once found favor, and every year has been used with increasing popularity.

The Goodall Worsted Company was established in 1889 by George B. Goodall, Louis B. Goodall, Ernest M. Goodall, and H. Hodgson. The Company located at Sanford, Maine, which owes much of its growth and prosperity to the Goodall enterprise.

While the Company may be said to have been made famous by its world-known "Palm Beach" fabric, yet these goods are by no means the only line in which it transacts a substantial volume of business. The products of the Goodall organization within a certain range of fabrics are as varied as

ishing processes. Employment is given to about 1700 persons of American and French Canadian extraction.

The field of operations of the Goodall Worsted Company is every quarter of the globe where their product is rendered peculiarly marketable because of climatic conditions. The foreign trade territory includes Canada, Mexico, South America, Cuba, Porto Rico, Hawaiian Islands, Philippines, China and Japan.

The present officers are as follows: George B. Goodall, president; Louis B. Goodall, treasurer; William S. Nutter, vice-president; William Batchelder, assistant treasurer; and

Thomas M. Goodall, clerk.

NEW BEDFORD STORAGE WAREHOUSE CO.

The founders of the New Bedford Storage Warehouse Company were the first to recognize the possibilities of New Bedford as a cotton storage center and the pioneers in erecting modern warehouses in that city. The Company was incorporated in 1910 by William M. Butler, Abbott P. Smith, Frederic Taber, John Duff, Frederic H. Taber, Nathaniel B. Kerr and James F. Bacon, with a capitalization of \$150,000. The storage capacity at that time was less than 35,000 bales of compressed American cotton. Today the Company owns and operates warehouse space representing an investment of

throughout the South to meet the shippers of cotton and solicit business. This activity on the part of the Company, it is felt, has been the strongest influence in bringing about its success.

The policy of the Company consists of the

following beliefs:

"A warehouseman's best asset is a thorough knowledge of his own business—no detail is too small to repay constant study. Good service is the best advertisement and a satisfied customer the best solicitor. While extravagance either in equipment or operation is disastrous, parsimony is equally so.



Unloading Cars at Warehouse Platform

\$800,000 with a capacity for 155,000 bales and in addition, leases a steel and concrete pier that will accommodate 15,000 bales.

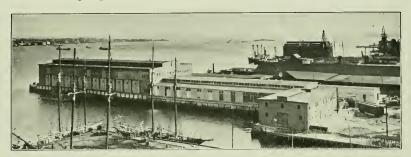
In 1914, the officials of the Company sent their first representative to the South in an effort to set forth the advantages of the city and its warehouses. Since that time, they have had the satisfaction of seeing the business develop along the lines that were originally planned. On account of the geographical location of New Bedford in relation to the cotton industry of New England, the city has become the leading spot cotton center of the East and the warehouse space has been developed to a greater extent than in any other eastern city. Since the inception of the Company, it has developed a strong service organization, sending representatives

Every service rendered should produce a reasonable profit. To give something for nothing necessitates an overcharge somewhere else. A dissatisfied employee is worse than useless and contentment in the working force is essential to efficiency."

The Company operates three large warehouses and the state pier at New Bedford. The "North Stores," a six-story building of approximately 250,000 square feet, is of mill construction, with a capacity for about 50,000 bales of cotton. The "Terminal Stores" is a nine-story reinforced concrete building of approximately 156,000 square feet, with a capacity for about 30,000 bales of cotton. It is equipped throughout with automatic sprinklers, which make it absolutely fireproof. It consists of sixteen different

sections, separated by fire walls and double fire doors. Handling devices consist of three large elevators, capable of lifting a carload of cotton at once, and portable elevators, which are used for piling cotton. The "Unof steel and concrete. It is equipped with an immigration shed for handling passengers and is on a 25-foot channel to deep water.

When Southern shippers of cotton who are customers of the Company are in New



View of State Pier, 750 Feet Long

ion Stores" building is modern, with a capacity of 75,000 bales. This building was formerly a cotton waste plant and it is planned to lease a large portion for manufacturing purposes.

The state pier is leased to the Company by the Commonwealth of Massachusetts, and on Bedford, the Company gratuitously assists them in selling in the eastern market by the provision of a cotton class-room and sales office at the Terminal Stores for their use. This department is known as "Promotion of Sales" and an experienced classer and cotton man is in charge.



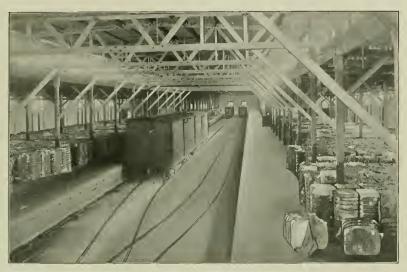
Unloading Cotton Cargo at State Pier

this pier they have received and unloaded shipments of cotton direct from the South, ships loaded with Egyptian cotton from Boston, as well as other ships with general cargoes, and a number of shiploads of sisal from Yucatan. The pier is 750 feet long, built

All three warehouses are situated adjacent to the New York, New Haven, and Hartford track, and have ample spur track facilities for the unloading of carload lots directly onto the warehouse platform. They are centrally located, making it especially conveni-

ent for withdrawal of cotton for delivery to the mills, either in New Bedford or the surrounding territory. A splendid system of highways radiates from New Bedford to all parts of New England, and cotton can be The annual turnover is approximately 200,-000 bales.

In the offices about twenty are employed. In the warehouses approximately thirty-five men are needed to carry on the work. Most



Interior of Shed on State Pier, Showing Double Track for 600 Feet, and Ample Platform Space for Handling Cotton Cargoes

delivered by motor truck from these ware-houses within six hours to cotton mills operating in the aggregate between 9,000,000 and 10,000,000 spindles. Within twelve

of these are Americans. The officers are as follows: William M. Butler, president; Clarence R. OBrion, treasurer and general manager; John J. Gobel, assistant general manager.



North Stores

Terminal Stores

hours mills operating approximately 15,-000,000 spindles can be easily reached. While much of the cotton handled is delivered in the East, the Company has the whole United States for its trade territory.

ager; Howard C. Dyer, assistant treasurer. Directors: William M. Butler, Clarence R. OBrion, John Duff, Abbott P. Smith, Frederic Taber, Frederic H. Taber, Elliot H. Wefer, Morgan Butler and Abbott M. Smith.

FARR ALPACA CO.

The Farr Alpaca Company, besides being one of the largest and most famous textile plants in the country, has also the distinction of being the first in the United States to manufacture all wool cashmeres and henriettas disproving the idea that France, hitherto the only source, was the only country where they could be produced, special advantages existing there which it was supposed were not available anywhere else. The Company was also the first to manufacture serge linings for successful competition with those made in Bradford, England.

The Company was founded, with mills at Holyoke, Massachusetts, by Herbert Marshall Farr, and his brother-in-law, Joseph Metcalf. Mr. Farr was the son of Marshall H. Farr, and born May 28, 1841, in Chesterfield, New Hampshire. The father was a successful contractor on the Great Western Railway, now a part of the Grand Trunk. When he was thirteen years old, he removed with his parents to Hamilton, Ontario, Canada, and in this place finished his school work. The textile field appealed to him, and finding a partner in George Randall, started in the year 1864 at Hespeler, Ontario, to make alpacas and knitted goods. While the business prospered from the very beginning, Mr. Farr, after some years decided that a more desirable field for the manufacture of such goods was in the United States, on account of the protective tariff system.

So in company with Mr. Metcalf he came to this country in 1873. Although Mr. Metcalf was born in Leeds, England, on March 24, 1841, his whole active career was passed in the United States. While a lad an accident to the eyesight of his father caused him to be adopted into the family of an uncle in Hamilton. He attended both private and public schools in that place and when sixteen years old started out in the business world. He was first with the Great Western

Railway and rose by successive steps to become treasurer of that Company.

In going over the country, Mr. Farr and Mr. Metcalf regarded Holyoke, on account of its superior water power facilities, as the most suitable location for the prospective plant. Mr. Farr came there to live in 1873. On November 13 of that year a company was incorporated, and D. H. Newton, a builder, of Holyoke, joined with them.

The company was organized to manufacture alpacas with a capitalization of \$250,-000. A year later, in November, 1874, Mr. Metcalf removed to Holyoke, where Mr. Newton built the mill. Mr. Farr became agent, and Mr. Metcalf treasurer, Jared Beebe was the first president. In 1874 operations began in the building on Bigelow street. Four hundred hands were employed at the start, compared with the present number of 3,500, and a payroll of \$3,250,000. Like the business in Hespeler, the enterprise in Holyoke was successful from the first. In fact, it may be said that there have been few cases in the history of industry in the United States in which a concern has enjoyed equally rapid and continuous prosperity. goods produced by the mills of the Farr Alpaca Company sprang into immediate popularity. The success of the Company was due to the remarkable ability of Mr. Farr as a manufacturer and also that of Mr. Metcalf as a financier.

From the outset Messrs. Farr and Metcalf gave closest and most indefatigable attention to every detail. It is worthy of note that the first meeting of the promoters was held just before the beginning of the financial panic in September, 1873. In spite of the general depression in business, the company was established on a firm foundation. At the meeting of November 13, the promoters decided on the erection of the necessary buildings. Work on these began very soon in December of the same year. The con-

struction was pushed ahead so rapidly that by June, 1874, the Company was able to produce and show every kind of goods manufactured in the plant. As mentioned in the preceding paragraph they at once became superior manufacture, very regular in quality, evenly spun and woven, and of permanent color and finish.

He said also that "the alpacas, cashmeres

and serges shown by the Farr Alpaca Com-



JOSEPH METCALF

popular, commanding recognition for their excellent quality and have continued to be in the forefront.

In the year 1876 the Company had an exhibit at the Centennial Exposition at Philadelphia where the medal for excellence was awarded. Henry Mitchell, the judge, expert from Bradford, England, in recommending the award, stated that the alpacas. mohairs, cashmeres, and serges were all of pany were especially good." This was extremely gratifying and only verified statements which had been made by the trade in connection with the product of the Company, at that time the youngest concern making dress goods. After these expressions were made the Company in a circular issued to the trade stated that it was determined to maintain its position at the head of the industry and would continue to spare neither effort nor expense to meet the requirements of the best trade. Now, nearly fifty years after that statement was made, the quality of the goods has retained that same excellence which the Company determined to keep. It was by no means easy for Mr. Farr, Mr. Metcalf and their associates in the business to enter on a work new to American manufacturers, but they persevered, overcoming all obstacles. Residents of Holyoke and Springfield and vicinity had faith in the management and bought stock in it, soon finding themselves shareholders in a very profitable business, steadily increasing.

When Mr. Farr died in 1900, Mr. Metcalf became agent, combining this office with

that of treasurer.

In 1914, a profit-sharing system was established by the Farr Alpaca Company which has since been described as the fairest and most satisfactory in existence. Under this plan, a wage dividend on the actual year's wages received, reckoned at the same rate per cent as the stockholders of the Company receive in cash dividends per share of stock, is given to each employee rendering satisfactory service, who has been with the Company for the full year previous, while the proportionate amount due to each employee who has been on the rolls lass than one year, or whose service is unsatisfactory, is not retained by the management, but is paid over to a pension fund for the benefit of the aged, or disabled workers. At the end of the first year, on January 5, 1915, a wage dividend of eight per cent, equivalent to nearly \$100,000 in the aggregate, was received by about 2500 employees, who rendered their thanks in an address delivered to Treasurer Metcalf at the annual meeting of the stockholders on Jan. 27, 1915, as follows:

"The employees of the Company believe that this is one of the important steps which has been taken in this country to solve the relation between labor and capital, and hope that it not only will be continued, but may be the means of establishing an enduring feeling of good-will between the stockholders and employees of the Company.

"Thus believing, the employees of the Company do hereby convey to you, and through you to the directors, their appreciation of the fairness and wisdom which has marked the institution of the profit-sharing plan, and especially do they express to you their heartfelt regard for your untiring efforts to deal justly with them, and to secure for them a fair share of the productive output of the Company, and in recognition of which service they present to you this testimonial of their affection and esteem."

Mr. Metcalf died in 1916, and as in the demise of Mr. Farr, his loss was deeply felt by members of the mill organization, the employees, and the community at large.

At the present time, when in full operation the Company uses considerably more than 10,000,000 pounds of wool in the production of its goods. It also consumes 3,000,000 pounds of cotton every year. The plant has shown tremendous expansion in every department and is greatly improved in machinery and method since the early years. It can undoubtedly be safely said that a single month's output at the present time is more than a yearly production in the seventies.

Its product of worsted dress goods and coat linings has the entire United States for a market. All of the raw material used in the product comes from abroad. The worsteds are manufactured from long wool combed, also wool from the Angora goats of Asiatic Turkey, and the alpaca from the alpaca sheep, a species of Ilama which is a native of Peru. The process in making the goods differs substantially from spinning and weaving the wool from the ordinary sheep. In the latter, the wool is shorter and requires carding before being made into cloth, and from which is manufactured the strictly woolen goods.

In the last thirty years many improvements, including enlargements and entire new buildings have been constructed in order to keep abreast of the demand for greater facilities and operating room. One of the buildings is 450 feet long by 134 feet wide, six stories high, which gives factory floor room of 350,000 square feet. Recent construction includes a finishing plant, a weave shed and cloth inspection and storage building, as well as a wool storage warehouse. A cotton warp mill is also another addition.

In 1920 the authorized capital stock was increased to \$14,400,000 by a seventy-five

capitalization was increased, the dividends averaged fifteen per cent every year. Dividends of recent years are as follows:

From 1910 to 1913 inclusive, twenty-four per cent each and 200 per cent stock dividend in 1913; 1914 and 1915, eight per cent each; 1916, 1917, and 1918, fifteen per cent each; 1919, first quarter, two per cent; second quarter, two per cent; third quarter, two per cent; fourth quarter, two per cent and seven per cent extra; total, 1919, fifteen per cent; 1920, eight per cent



Mills of the Farr Alpaca Company, Holyoke, Massachusetts

per cent dividend of \$5,400,000, and the sale of \$1,800,000 new stock at par, from \$7,200,000. The remaining twenty-five per cent or \$1,800,000, was sold to stockholders.

On account of the efficient management of the business and the company's uniformly good dividend record, including several stock dividends Farr Alpaca has for a considerable length of time been one of the most desired stocks on the part of investors. Plant expansion will make it possible to increase sales. The superior quality of the product will insure the continued popularity. On the former capital, or rather before the

on \$7,200,000, and seventy per cent stock dividend; 1921, eight per cent.

The equipment required for the production of goods includes forty-nine combs, 40,720 spindles, 4,000 looms, thirty-five boilers, and four water wheels. The annual product is valued at \$15,000,000.

The present officers are as follows:

E. W. Chapín, president; C. W. Rider, vice-president; F. H. Metcalf, treasurer and manager; A. L. Green, assistant treasurer; H. F. Metcalf, agent; E. R. Alderman, manufacturing superintendent; A. Wood, superintendent of dyeing and finishing.

Henry C. Martin, of New York, is sole celling agent.

INNIS. SPEIDEN & CO., FOUNDED 1816

The War of 1812, though of short duration, revealed to the United States the need of more textile mills, if a rapidly growing population were to be adequately clothed in the event of interrupted trade relations with Europe.

Responding to this apparent need, the already established mills were enlarged and many new ones built by the time 1816 had arrived. This expansion of the textile industry only accentuated the less serious but no less inconvenient dearth of easily acquired dye materials, once the woolen or cotton manufacturer had produced his cloth.

Importing from England and France, the then common sources of dyestuffs, was subject to vexatious delays; the bulkier, cheaper and more desired raw material used for dyeing cloth and yarn came from countries just south of us, bordering on the Carribbean Sea, was shipped to Europe, prepared added to the merchandise dealt in, and from that time on this firm was recognized as a source of supply by those requiring chemicals as well as dvestuffs.

Aaron Innis dying in 1844, his eldest son George, abandoned a college course to learn the business in which his father's estate

owned the controlling interest.

Howland Sherman dying in 1858, George Innis became the sole owner of the business, operating it under the old firm name.

In 1885 Hasbrouck Innis, son of George, and Wm. R. Innis, son of Aaron, 2nd, acquired the business, changing its name to Innis & Co., under which style it continued until 1906, the name and good will meanwhile, having been purchased in 1904 by Geo. V. Sheffield.

In 1906 the Company was reorganized and incorporated under the name of Innis. Speiden & Company, C. C. Spieden, to-



Isco Chemical Company Inc., Niagara Falls, New York

for use, and shipped back to America. This, in the days of sailing vessels, and not many of them, involved much time and expense.

In the year 1816, Nathan Gifford, a Scotchman, erected a dyewood cutting mill at Poughkeepsie, N. Y., but found his capital insufficient to swing the venture. A leading merchant and Hudson river freighter, of Poughkeepsie, Aaron Innis by name, recognizing the soundness of the enterprise and scenting profitable freight for his vessels both up and down the Hudson, came to his rescue by supplying the necessary capital and putting his con-in-law. Howland Sherman, in charge of the business, thus establishing the firm of Gifford, Sherman and Innis, with mills at Pough-keepsie and a New York office and warehouse for the importation headquarters of those older and less bulky dyestuffs which came largely from the East Indies, such as Indigo, Turmeric, Lac Dye, Cutch, etc.

The business grew apace and it was soon found that to fulfill a logical development. such chemicals as were used for mordanting cloth in the the process of dyeing must be gether with Geo. V. Sheffield securing a controlling interest; the business was modcrnized and greatly enlarged in the scope of its activities; in 1916 the Company built and equipped an electrolytic plant at Niagara Falls, known as the Isco Chemical Co. (see illustration) in order that its selling organization would have something to sell in place of other chemicals which previous to the World War of 1914 had been imported from Europe.

Previous to the last named date, Innis, Speiden & Co. purchased and remodeled 46 and 48 Cliff street, New York City, its principal headquarters, with branches and warehouses in Chicago, Boston, Philadelphia, Cleveland and Gloversville, and factories at Niagara Falls, Murphysboro, Jersey City and Owego, together with several agencies abroad for buying and selling in the princi-

ral marts of Europe.

Its constant aim is to fulfill the purpose originally conceived in 1816, viz, to serve as a reliable source of industrial chemicals to the many industries in the United States and Canada needing such service.

T. HOLT HAYWOOD DEPARTMENT

of

FREDERICK VIETOR & ACHELIS

The T. Holt Haywood Department of Fred'k Vietor & Achelis occupies a commanding position in the dry goods commission world. As selling agents for some of the most influential colored cloth mills in the South, the house is recognized as an important factor in the field.

Its remarkable growth and continued success is traceable to broad vision, splendid ideals and progressive management, backed by extreme fairness and generosity both with



T. HOLT HAYWOOD

its consignors and its clientele. Each year has seen substantial growth in the number of mills and in volume of sales, until today the yearly business is many millions of dollars, the diversified products of twenty-nine cotton mills located chiefly in the Carolinas and Georgia. Among these important corporations are The Eagle & Phenix Mills, Highland Park Mfg. Co., Anchor Mills, Brown Mfg. Co., L. Banks Holt Mfg. Co., Aurora Cotton Mills, Arista Mills Co., Wennonah Cotton Mills, Arista Mills Co., Wennonah Cotton Mills, Fort Mill Mfg. Co., Cornelius Cotton Mills, Fort Mill Mfg. Co., Cornelius Cotton Mills, E.M. Holt Plaid Mills, Carolina Cotton Mills, E. Mellemont Cotton Mills, Alamance Cotton Mills, Oneida Cotton Mills, Holt Gant

& Holt Cotton Mfg. Co., Bradley Mfg. Co., Spartanburg County Mills, Mayo Cotton Mills, George Cotton Mills, Vivian Cotton Mills, Indian Creek Mfg. Co., John Rudisill Mfg. Co., Helena Spinning Co., Richard Hey & Son, Passaic Print Works, Pamlico Cottons Ltd.,-manufacturers of well known and long established brands of woven colored fabrics of all descriptions,-tickings, hickory shirtings, cheviots, chambrays, denims, cottonades, suitings, staple ginghams, fancy dress ginghams, plaids, plaid suitings, shepherd checks; various grades of napped cloths, such as outing flannels, flannelettes and canton flannels; also sheetings, drills, fancy weaves, and special fabrics for export; blankets and linings; cretonnes, percales, calicoes and bleached goods; and cotton yarns,-hosiery, underwear and weaving varns.

Organization, coördination, leadership of a high order, and scientific salesmanship must combine to market successfully this big volume of business and this house has built up a selling organization admittedly one of the most able in the market.

The Department, established at its present location, 65 Leonard street, New York, about thirty years ago by Mr. J. E. Prior, was a distinct success from the outset. Mr. Prior, a good merchant and good organizer, built well and carefully for the future. In 1910, when only fifty-four, Mr. Prior died. His assistant, Mr. J. A. Mosely, succeeded him. Mr. Mosely was a man of splendid character and attainments, and in his five years administration the Department showed a satisfactory development. When Mr. Mosely died in 1915, Mr. T. Holt Haywood assumed management. He is probably the youngest man in the market to occupy a position of such responsibility and opportunity. Mr. Haywood has a rare personality, combining sound merchandising judgment with progressive leadership, and under his direction the Department has broadened and assumed its present commanding position.

Besides securing and successfully merchandising many new colored cloth accounts, Mr. Haywood has introduced printed fabrics of the Passaic Print works and bleached cottons of the Pamlico Cottons Ltd., and has added a well organized and splendidly equipped yarn department, handling the entire output of eight well known southern yarn mills, manufacturing a full line of hosiery, underwear and weaving yarns.

A. KLIPSTEIN & COMPANY

One of the largest and most prominent suppliers of chemicals, colors, dyestuffs, and other materials, to the textile industry in the United States is A. Klipstein & Company, 644-652 Greenwich street, New York City. This concern was founded by August Klipstein in 1872, the office and warehouse being located at 8 Cedar street. Its quarters soon proving too small, the business was moved to Platt street, afterwards to 52 Cedar street, and finally to 122 Pearl street,



Plant of A. Klipstein & Company, New York City

where it remained until February 28th, 1910, when the entire offices and warehouse were destroyed by fire. Business was immediately resumed temporarily at 129 Pearl street, at which place it remained until 1912, moving thence to the present quarters, at which address it occupies the entire structure and maintains there the offices, warehouse, laboratories, sampling rooms, and shipping and receiving departments.

In 1894 the firm was incorporated under its present name, A. Klipstein & Company, of which August Klipstein became president; W. H. Jackson, vice-president; and E. C. Klipstein, secretary and treasurer. In March, 1921, occurred the death of Mr. Jackson and he was succeeded in the Vice-presidency by A. Klipstein, Jr. As long as he was able to do so, Mr. Jackson took an active part in the affairs of the concern, and the other gentlemen, who have retained their

position are still doing so.

The firm's connections both here and abroad are very extensive. They maintain branch offices in Boston, Providence, Philadelphia, Chicago, and Charlotte, N. C., and are represented in Canada by A. Klipstein & Company, Ltd., Montreal. They have selling and buying agencies in many European, far eastern and South American cities. Among the various domestic manufacturers whom they represent are the Bulls Ferry Chemical Company, Edgewater, N. J., organized in 1891, manufacturers of softeners, finishes, sulphonated oils, colors, etc., and E. C. Klipstein & Sons Co., Chrome, N. J. and South Charleston, W. Va., manufacturers of colors, dyes and intermediates.

A. Klipstein & Company have been for a number of years large suppliers of raw materials used by the textile, leather, varnish, linoleum, rubber, and other kindred manufacturers; importing such articles as quebracho from South America, mangrove from Africa, myroblams from India, kauri gum from New Zealand and Congo copal

gum from Africa, etc., etc.

The company's banking connections both here and abroad are of the best, and in financial as well as trade circles the firm is looked upon as being one of the leading factors. Among the various trade organizations throughout the country in which they hold membership are the United States Chamber of Commerce, American Chemical Society, Merchants Association of New York, Board of Trade and Transportation, National Association of Manufacturers, Silk Association, American Cotton Manufacturers Association, and the Paint, Oil and Varnish Association.



AUGUST KLIPSTEIN
President of A. Klipstein & Company
Chemicals, Colors, and Dyestuffs

NAUMKEAG STEAM COTTON CO.

Wherever the product of the Naumkeag Steam Cotton Company of Salem, Mass., has been shipped, the standard of excel-lence of "Pequot" in sheets and pillowcases has been maintained, according to the business maxim of the company. This has been accomplished by specialization and strictest attention to quality and appearance.

The Company was established and incorporated in 1839, largely through Salem and Essex County interests, although building did not begin until 1845. The project to build a cotton mill in Salem was regarded as most unusual, since until that time such factories had been built alongside a water course. The engineer in charge, however, thought the atmospheric conditions suitable for spinning and weaving, like those near a stream, might be found beside the sea. A steam power driven mill, moreover, was by the status of the Company. The annual turnover is over 20,000,000 yards of cotton sheeting, from 30 to 110 inches in width, and requiring 150,000 spindles and 3000

On June 25, 1914, the plant was almost entirely destroyed in the Salem fire, but quickly rebuilt on modern lines, and operated throughout by February, 1916. After the fire, all that was standing were the boilerhouse, with its twenty-six boilers, a cotton storehouse, and a cloth storehouse. Determined, however, that Pequot sheetings should not cease to be produced for more than a short time, the management continued their manufacture, installing wide looms in the cloth storehouse and a portion of the weave shed erected the first thing of all. Yarn was purchased until the spinning



Plant of the Naumkeag Steam Cotton Company, Salem, Mass.

rather unique, as the mills in Lowell and Lawrence and other parts of New England were driven by water power. By January, 1848, the concern was in full operation. Dividends were paid stockholders that year.

In a report dated January 19, 1848, Charles T. James, the engineer in charge, stated that specimens of the goods "took the premium at the last annual exhibition of the Mechanics Charitable Association at Boston and that of the American Institute at New York as being superior in quality to any other article of the kind offered at either place.'' He also added that the mill was the largest in the United States and of novel construction and that the character was such that with the aid of sound judgment, scientific knowledge and great practical skill its success could hardly fail to equal the "reasonable wishes" of those interested.

That these "reasonable wishes"

been realized and even exceeded is evident

mill under construction could produce enough, and in five weeks the trade again received Pequot sheetings. Fifteen hundred looms were in operation within what is stated to be a shorter time than any such undertaking had previously been attempted. weave shed, one of the largest in the world under one roof, and equipped with automatic looms, covers seven acres. Enough brick boarding houses and modern tenement houses to accommodate 60 families were quickly erected. Temporary office quarters were secured at the Salem Y. M. C. A. July 2, 1914, the Naumkeag paid its 1,500 operatives full wages for the week ending June While the factory was being rebuilt stockholders received dividends as usual. They were safeguarded from loss by insurance on the plant for "use and occupancy." In fact the Naumkeag aims to keep a reserve fund to meet any financial crisis that may occur.

To William P. McMullan, the agent at the time of rebuilding, is largely due the credit for the modern layout and great efficiency

of the new Naumkeag.

Pequot sheets and pillow-cases constitute nine-tenths of the product. The Naumkeag and Salem brands are also made. The Naumkeag fabric is of particularly fine selected yarn. The Salem brand is a lighter cloth. Naumkeag twills have a certain nap desired by some customers. The yarns are double carded, and of a soft twist that makes a beautiful sheeting.

The Danvers Bleachery and Dye Works, Peabody, Mass., is an important factor in making the goods. The Danvers Bleachery in the civic life of the city and are known as influential residents. The plant is one of the largest in the world. Since operation began, over seventy-five years ago, the quality of the cloth has become unsurpassed.

The presidents have been David Pingree, Edward D. Kimball, Asahel Huntington, Richard P. Waters, Francis Cox, David Pingree, John F. Brooks, Grant Walker, and Henry P. Benson, the present incumbent.

The eight treasurers have been Nathaniel Criffin, Edmund Smith, David Pingree, Edmund Dwight, John Kilburn, Henry D. Sulivan, Frederic Dexter, and Nathaniel G. Simonds.

The company has had only five agents, Edmund Smith, the first one, served from



was started in 1846 by Theophilus Walker and for a long time finished the Naumkeag sheetings as a separate organization. Within a few years it has been taken over by the Naumkeag. At the Bleachery, the sheetings are given an unusually fine bleach and finish. The original stone building, erected in 1846, is still used for bleaching wide sheets, tearing, hemming, and sewing. The Danvers Bleachery is a leader in this work as well as in finishing sheets and pillow-tubings. Some twenty-five years ago the management conceived the idea of tearing and hemming and making up finished sheets and pillow cases in a factory rather than in a home, starting with five machines. Now 200 are in use.

The Naumkeag Steam Cotton Company has had little, if any, labor trouble. The overseers are of an unusually good class of men. Many of them, as well as of the other employes, have held their positions for long periods. Several have become prominent 1845 until his death in 1863; John Kilburn succeeded him in 1863 and likewise served until his resignation which occurred in 1878; E. F. Balch was the third agent who held the position from 1878 until he died in 1892; W. P. McMullan, who was previously assistant agent, served from 1892 until his death in 1918; J. Foster Smith, the present agent, succeeded Mr. McMullan in 1918. Mr. Smith was clerk from 1896 until 1918.

The officers now are: President, Henry P. Benson; treasurer, Nathaniel G. Simonds; agent, J. Foster Smith; clerk, Ernest R. Boyd. Directors, the President, Treasurer, and Albert D. Bosson, S. Parker Bremer, Charles E. Perkins, Dudley L. Pickman, and Joseph S. Sylvester.

The merchandising of the Naumkeag products has for many years been taken care of by the old established firm of Parker, Wilder & Co., with offices in Boston and

New York.

WEST POINT MANUFACTURING CO.

Wonderful West Point, it is often called, and the growth of the West Point Manufacturing Company since its establishment some thirty-five years ago has been really remarkable. From a small beginning at Langdale, Alabama, where the Lanier family started the first mill, the West Point, under the Laniers and Wellington, Sears & Company, has been developed into one of the largest and best known duck manufacturing organizations in the country with a capital of \$5,000,000 and a chain of mills extending south of West Point, on the Alabama side of the Chattahoochee River and along the Chattahoochee Valley Railroad out to Riverview. The big modern mills in Alabama at Langdale, Shawmut, Fairfax, and Riverview, operated by the West Point's own electric power plant, and the West Point Utilization Company, represent an investment of at least \$10,000,000, money that has been systematically spent for the development of an efficient and prosperous organization which today occupies a unique position in the cotton manufacturing industry.

The West Point Manufacturing Company was incorporated in 1887 under the laws of Alabama. Previous to that date the Laniers had operated a small mill at West Point, but this was destroyed by fire and a new plant was erected at Langdale, Ala. In the early days the West Point Manufacturing Company had approximately 10,000 spindles and 250 looms at Langdale. The Company was capitalized at less than a half a million up to about 1900. N. Boynton & Company and their successors, Wellington, Sears & Company, were interested in the mill practically from the start, but it wasn't until the formation of the Consolidated Duck Company that Wellington, Sears & Company began to take an active part in helping to build up the present splendid organiza-

This Boston commission house had been one of the selling agents for the mills that made up the big duck trust, and when the merchandising of the latter's products was turned over exclusively to J. Spencer Turner and Company which had come under the control of the trust, Wellington, Sears & Company were left without an adequate supply of cotton duck, and, for this reason, decided to go into the duck business in a large way.

Beginning with 1906 the growth of the West Point Manufacturing Company was very rapid. In that year the capital stock was increased from \$500,000 to \$1,500,-000. The million of new money was used for the erection of a new mill at Shawmut, Alabama, and for the development of the company's fine water power on the Chatta-hoochee river. The Shawmut Mill started with about 20,000 spindles and some 200 looms. Its equipment has been increased to 30,000 spindles and to approximately 400 looms. The next addition to the West Point's property was a new mill at Fairfax, which was erected in 1916 from the proceeds of a \$500,000 increase in capital in The West Point's capital stock remained at \$2,000,000 from 1915 up to 1920. The Fairfax Mill has grown from 20,000 spindles and 500 looms to 32,000 spindles and 980 looms. The total equipment of the West Point today includes 100,000 spindles and over 2,200 looms. The Company's product is cotton duck for all requirements, government, civilian, and mechanical. During the war West Point was one of the two or three big concerns which got the bulk of the duck business placed by the government. The West Point has for a number of years shipped large quantities of heavy fabric to export markets. This corporation also owns the

Riverdale Mill at Riverview, Alabama, which has an equipment of 13,000 spindles

and 340 looms.

The West Point's capital stock was increased in 1920 from \$2,000,000 to \$5,000,000. The additional \$3,000,000 included a fifty per cent stock dividend. The other \$2,000,000 was new money to be used particularly for strengthening the financial position of the Company's business,

but in part for new construction.

One of the biggest assets of the West Point Mfg. Co., is its water power development. Up to 1914 the Company had put something like \$400,000 into water power development, and since then this item has been considerably increased in value, so that today it probably represents an investment of close to \$1,000,000. The Company has its own big electric power plant, with seven boilers and eight water wheels at Langdale, and four water wheels at Riverdale, and all four mills are operated by power generated at the central plant. Another property of the Company is the West Point Utilization Company, which was organized three or four years ago for taking care of the cotton waste produced as a by-product at the different duck manufacturing plants. The West Point also owns the Chattahoochee Valley Railway, a branch line running south from West Point along the right bank of the river. All the mills of the company are located along this line and are, therefore, assured of adequate shipping facilities.

The presidents of the West Point Manufacturing Company have been W. C. Lanier, L. Lanier, W. A. Bullard and Joshua B. Richmond. Mr. Richmond has been at the head of the corporation for the last eight or ten years. Horace S. Sears of Wellington, Sears & Company has been treasurer of the corporation since its incorporation in 1887. George H. Lanier, vice-president and general manager, has occupied this position since about 1910. The Laniers and Wel-

lington, Sears & Company have worked together for a long time to bring the West Point organization up to its present high standard of efficiency. The continued prosperity and growth of the West Point are a fine tribute to the manufacturing and merchandising abilities of the mill management and the selling house.

The following figures will show how the value of the physical property of the West Point Manufacturing Company has been increased during the past twenty-five years. In 1907 the real estate, machinery and other fixed assets of the corporation were valued at something over \$800,000. During the five or six years following the erection of the Shawmut Mill, the fixed assets of the West Point averaged about two and a half million dollars. The figures since then, as noted in the Corporation's balance sheets, have been as follows: 1916—\$4,024,574; 1917— \$4,588,244; 1918—\$5,073,062; 1919— \$5,853,335; 1920—\$7,106,410; 1921— \$9,560,139.

Another indication of the continued success of this corporation is to be found in its dividend record. For twenty-five years beginning with 1889 annual dividends averaged nine and three-quarters per cent. Dividends paid to stockholders since 1914 have been as follows: 1914—eight per cent; 1915—eight per cent; 1916—thirteen per cent; 1917—fifteen per cent; 1918—fifteen per cent; 1919—fifteen per cent; 1920 twenty per cent; 1921—eight per cent (on capital of \$5,000,000). As previously mentioned, the company distributed a stock dividend of fifty per cent in 1920, when the capital was increased from \$2,000,000 to \$5,000,000.

The West Point's modern and well-kept manufacturing equipment and its capable mill management and progressive selling policy, assure its continuance among the most prosperous cotton manufacturing organizations in the country.

S. SLATER & SONS, INC.

Samuel Slater established the first Slater mill at Webster, Mass., the first woolen mill in America, 110 years ago, and the plant began manufacturing uniform cloths. The United States shortly afterward called on the mill to supply cloth for the army and navy, lt was so well made that the Company still fills large orders for the government today.

Almost up to the day of his death, Mr. Slater operated the Webster Mills. He was succeeded by his son, Horatio N. Slater, who had been taken into the firm in 1829. For nearly forty-five years he practically controlled the business, developing it rapidly

Tiffany into the firm. The title then became Slater & Tiffany. In 1818 Mr. Tiffany retired, Mr. Slater becoming the owner. A small woolen mill was started by Mr. Slater and Edward Howard in 1815, for broadcloths and similar woolens. In 1820 this mill was burned. Business continued in new mills under the name of Slater & Howard. Mr. Slater purchased his partner's interest in 1829 and took into the business his sons, George B., John, and Horatio Nelson Slater, under the title of Samuel Slater & Sons. It is understood that in these mills at this time American broad-



Slater Mills, Webster, Massachusetts

and maintaining the strength which it had acquired under his father's management.

Horatio N. Slater had unusual executive ability. He also constructed looms and improved his machines. He had a knowledge of fibre, particularly wool. When he took charge he met a transportation monopoly by building a railroad himself.

Horatio N. Slater, Jr., his nephew and adopted son, became his heir, and was head of the business until he died in 1899. It has since been conducted under trustees by the will of Horatio N. Slater, Jr.

In the early days of the mill at Pawtucket to which Mr. Slater first came, and referred to in the early chapter of this book, farmers and others bought the yarns for hand looms. Manufacturers also wove them. But in 1811, Mr. Slater built the Green Mill for weaving at Oxford South Gore, taking Bela

cloths were first manufactured. In 1907 the Wuskanut Mills at Farnumsville were bought and operated until 1920 when sold.

Uniform cloths, liveries, woolen and worsded suitings, silesias, percales, warp and filling sateens, cambrics, printed linings, and shirtings are made. Printing, dyeing and finishing is also done. Produced annually are 550,000 cotton pieces and 40,000 woolen and worsted.

The officers of the company are Jacob F. Brown, president; H. N. Slater, vice-president; Spaulding Bartlett, treasurer. W. T. Stewart is cotton goods superintendent; Charles P. Doane, woolen goods superintendent; and R. M. Mitchell, cotton converting superintendent. The directors are Jacob F. Brown, Spaulding Bartlett, H. N. Slater, Wm. H. Wellington, Francis T. Homer, B. Sumner Welles, and James B. Murphy.

DANA WARP MILLS

From about 600 spindles to the present total of 52,000 ring spindles and 8,000 twisting spindles, is in part the growth in the size of the Dana Warp Mills at Westbrook, Me. The treasurer and general manager of this Company, W. K. Dana, has the unusual record of fifty-five years of active service in those capacities. The business was estab-lished in 1866 by Mr. Dana in the above mentioned town. Hard work and constant endeavor to please, Mr. Dana's policy since the inception of the business, have won for it a high reputation. The products of carded and combed cotton yarn and cotton grain bags, with specialties of colored warp and twist warp, have been of such excellent quality that their users have been consistent purchasers ever since they began to buy them. The grain bags manufactured by the Company are shipped all over the United States and the cotton yarn and warp are in demand throughout New England. The annual turnover is 4,000,000 pounds per year and the present output has doubled since 1908. In addition to the present spindleage of 60,000, one hundred times

the number with which the plant started, there is a modern, well-equipped dyehouse with a capacity of 70,000 pounds per week. The present capitalization of the corporation is \$1,000,000.

Among the advantages that the concern enjoys is a good class of employees, most of them American citizens, of French Canadian descent, the majority of whom were born in Westbrook. The Company furnishes houses for its employees at a low rental. Another advantage is nearness to the bulk of the customers. The Company believes in advertising, and does so in the trade papers.

While for fifty-five years the business has been under the management of W. K. Dana, it started under the name of Dana & Mc-Ewan, later had the title of W. K. Dana, W. K. Dana & Co., and, since incorporation in 1893, the Dana Warp Mill. Mr. Dana

W. K. Dana & Co., and, since incorporation in 1893, the Dana Warp Mill. Mr. Dana has always been an active G. A. R. man and in politics a Republican. The present officers are: President, Philip Dana; vice-president, William T. Cousens; treasurer, W. K. Dana; superintendent, Luther Dana.

S. SILBERSTEIN & SON

S. Silberstein & Son do a large converting business, selling staple and fancy cotton



MEYER SILBERSTEIN

fabrics on commission for several mills. The firm was established in 1898 at 51 W. Third street, New York City, by Mr. Solomon Silberstein. New quarters were sought, twice on Wooster street, again on West Third street, then the present spacious salesrooms at 3-5 Washington place, supplemented by several warehouses for the storage of merchandise.

In 1914, Mr. Solomon Silberstein took his son, Meyer, into partnership. They continued in business together until May 24th, 1918, the date of the elder's death. The present head of the business is Meyer Silberstein. He is the chief executive of S. Silberstein & Son and the president of the Multi-Products Export Corporation, the export department of S. Silberstein & Son, which was incorporated in February, 1919. The officers of the latter Company are: President, Meyer Silberstein; vice-president, Fred Kissner; treasurer, A. Joseph Geist; and secretary, George H. Rosenstein.

The Company has offices in the large trade centers of South America, in Mexico and Canada and has an office in Paris. The Export Corporation handles all classes of textiles, including piece goods, knit goods, and made-up garments.

UNIVERSAL WINDING CO.

For many years prior to 1890 few improvements had been made in the art of winding fibre for market or for use in mills, the attention of manufacturers of



JOSEPH R. LEESON Founder and President of Universal Winding Company

winding machinery being centered largely on the production of machines to be sold at low price.

Joseph R. Leeson recognized the crudeness and defects then existent, and sought a method of winding which would insure perfect delivery of the material for all purposes—either for market or for succeeding

operation in mill practice without subjecting it to undue stress or abrasion. With this intent he secured the services of a well-known inventor, Simon W. Wardwell, who evolved the principle of winding now generally known as the "Universal, invented machines to make available his discovery. Whereupon Mr. Leeson took out fundamental patents covering the process and machines.

The economies and advantages of this system were so apparent as to insure the probability of its universal adaptation for both market and mill purposes, and warranted the adoption of the name Universal Winding Company when in 1893 a corporation was organized under the laws of Maine to develop the business. In 1916 the Company was re-incorporated under Massachusetts laws.

The adaptation of machines to market requirements has been steadily carried forward with a result that over two hundred mechanical patents have been issued, and at this date nearly fifty styles of machines fully protected by patents have been sold throughout the world wherever textile ma-

chinery is used.
The "Universal" Winding system is now complete in its adaptation to the entire range of textile mills for which winding is required, including machines for winding filling for plain and automatic broad loom shuttles, filling for ribbon and narrow fabric looms, doubling or folding for twister supplies, tubes for warp, cones as supplies to knitting machines, multiplying yarns for wire insulating machinery, tubes for regular and high speed braiding machines, electro magnet coils for meters, transformers and various electrical apparati, thread, twine, cords, small rope, asbestos, tinsel cord, solder, etc.

'Universal" winding machines are instruments of precision, designed largely with self-oiling features to insure durability, the absence of friction and general

mill economy in operation.

The principal works of the Company here illustrated are in South Auburn, a section of the city of Cranston, R. l., just beyond the southern boundary of the city of Providence. The property contains approximately twenty-four acres of land, bounded on the south by the Pawtuxet river, on the east by the main thoroughfare to the south, and on the north and west

400 by 80 feet. The Pawtuxet river, on which the Company has riparian rights for approximately 1500 feet, as well as artesian wells, furnishes ample water supply both for general purposes and a complete fire protective system of approved layout. The total floor area is approximately three hundred and sixty thousand square feet.



Works of the Universal Winding Company, South Auburn, Rhode Island

largely by the main line of the New York, New Haven & Hartford Railroad from which spur tracks run into the works with platforms for shipment from the principal buildings. The new foundry, 475 by 160 feet, includes tracks for receiving and distributing material and metal and is pronounced by experts one of the best laid out and equipped foundries in the country. All the principal buildings are of approved brick mill construction, the largest being

The Universal Winding Company either maintains its own agents or is represented in every country having an established textile or electrical industry. Parts depots are maintained at convenient points so that prompt service can be rendered to machines operating in any country, a feature of "Universal" machines being the complete inter-changeability of parts.

The Company's executive offices are at Boston.



AMERICAN PULLEY CO.

One of the elemental factors in the development of the textile trade and one which became of great importance with the invention of the first power driven textile machine and has since "grown up" with the industry,

is the belt pulley.

The pulley, together with the lever, the screw, the wheel and axle, the wedge and the inclined plane, comprise the six simple machines of mechanical power. Every machine known to man is built on one or more of these principles; the most complex modern machinery being but a combination or variation of some of these six appliances.

Before a machine can operate, there must be a means of supplying power to it. Long ago, when air and water were the only sources of power known, windmills and waterwheels were used to develop this power, which by means of pulleys and belting was then conveyed to the primitive machines. The first pulley, no doubt, was rudely constructed from the cross section of a tree which was cut and rounded into shape. These original pulleys were later followed by wooden pulleys turned in lathes.

With the introduction of steam driven machinery, belt pulleys came into greater prominence and the next step in their development was made with the introduction of the cast iron pulley, which in many ways was an improvement over the wooden

pulley.

It seems incredible that it was not until the latter part of the 19th century that steel was found to be the best material from which to construct pulleys. Previously, mechanical experts had either been unsuccessful in the application of steel to pulley design, or had overlooked entirely this most logical of pulley materials.

Just as it took Columbus to discover the simplest way to stand an egg on its end, so it took Thomas Corscaden, of New Britain, Connecticut, to discover both the best material for the manufacture of pulleys and the simplest and most effective method of application. In fact, Mr. Corscaden secured patents on so many basic principles of steel pulley construction that no one has since devised a steel pulley approaching his in simplicity and correctness of design. He also secured patents on a number of ingenious machines for making different parts of his pulley.

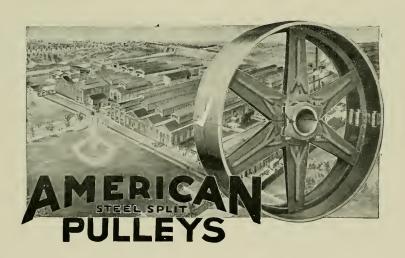
Mr. Corscaden gained the interest and cooperation of a group of men in Philadelphia, who organized The American Pulley Company in the year 1895. At first this venture was looked upon with doubt and misgiving, but it did not take long for the "American" pulley to prove its value as a transmission appliance. Up to the present time, there have been manufactured and sold over 3,000,000 American Steel Split Pulleys. Though of course the major part of this output has been marketed in the United States, there is hardly a country from British Columbia to South Africa, from Russia to New Zealand, or from South America to China where they are not sold and used with efficiency and satisfaction. The distribution is through mill supply houses of which about 250 carry the "American" pulley in stock in the United States.

In the manufacture of textiles, the consequence of the power factor as an element of cost is well organized. It is therefore interesting, as a matter of information, that the textile mills are larger users of "American" steel belt pulleys than any other single industry. Efficiency and economy in service are essentials which are combined in this product to an unusual degree. The pulley has been developed and improved from time to time as is consistent with progress in a leader in its line. The fact that these developments have been made only as they were proved and demonstrated to be an advance in the art, has made it possible to offer a pulley which has given unusual satisfaction.

The American Pulley Company manufactures, besides pulleys, a line of pressed or stamped steel beams, reels and spools which are widely used among the textile mills.

Being of steel these articles are not easily broken and consequently have a long life and are an economical purchase in the long run. Many thousands of them are in use today and the demand is a growing one.

Back of the products of this Company is a sound financial condition, highest credit, a record of progress and fair dealing and a reputation for living up to obligations which provides a purchaser with that assurance which is so necessary to satisfactory business relations.



JOHN CAMPBELL & CO.

The war period and its aftermath of reconstruction will remain as the beginning of a new and greater chemical industry in



JOHN CAMPBELL

the United States. The marvelously accelerated growth of the old established manufactories was paralleled by the inception of new forces in the market, procuring their products from brand new plants erected and equipped with the speed and efficiency peculiar to the times. It is not inaccurate to classify John Campbell & Company with the recently founded enterprises. Though the company has sold dyestuffs in America for many years, among domestic manufacturers it is a newcomer that has already become a recognized producing factor.

John Campbell was the dominant personality of John Campbell & Company throughout its early history. He came to



Plant of John Campbell & Company

America from England in 1876 to represent the English house of Levenstein. Here he founded a flourishing business in dyestuffs and upon his death in 1905, left a name and organization that were the foundation of his successors' fruitful accomplishments. Formerly the firm imported all of its dyes from abroad. The first departure from this policy was made in 1915 and was due directly to conditions following the outbreak of the war in Europe. A small plant was built at Newark, N. J., for the manufacture of naphthol green. Situated on the Newark Meadows, and so unhampered by urban space restrictions, ample room was left available for expansion. Four years sufficed to see realized the most surprising accretion of productive strength. Thirty-two separate and distinct buildings now form the properties of the Newark plant. The production consists of a comprehensive variety of colors in the direct, developed, acid, chrome and sulphur series.

An additional asset of great value among the company's productive agencies was ac-



Trademark of John Campbell & Company

quired July, 1918, with the purchase of the Republic Color & Chemical Works, of Reading, Pa., where are now made various intermediates for the supply of the Newark plant.

John Campbell & Company has been a corporation since 1907. After its successful performance in manufacturing, its products gained a ready market and the recognition given only to articles of merit and dependable quality. The Campbell products may all be identified by the trade-mark name "Camel Dyes," a reproduction of which is shown on this page. The main offices are at 75 Hudson street, New York City, and branches are maintained at Boston, Philadelphia, Providence, Chicago, Ill., and Toronto, Canada.

U S BOBBIN & SHUTTLE CO.



Mills of U S Bobbin & Shuttle Company

The U S Bobbin & Shuttle Company is an outstanding example of the important part that automatic machinery plays in modern industry. Largely through the substitution of automatic machinery in place of old fashioned manufacturing methods this company has grown from a consolidation of five comparatively small companies in 1869 to what is to-day probably the largest concern of its kind in the world. Its products are widely distributed throughout the United States and in practically every foreign country operating textile mills.

The present size and importance of the U S Bobbin & Shuttle Company should not be passed over without giving due credit to the integrity and business ability of its officers, even though they be exceedingly modest in this respect. The so-called Northrop Loom bobbin for use in automatic filling changing looms was perfected by Mr. Luther C. Baldwin, to whom was granted a patent covering application of rings to the bobbin.

Some of the companies that took part in the consolidation of 1899 have been in business for fifty years or more. Those in the original combination were as follows: James Baldwin Company, Manchester, N. H., and Lewiston, Me.; Fall River Bobbin & Shuttle Company, Fall River, Mass.; L. Sprague Company, Lawrence, Mass.; William H. Parker & Sons, Lowell, Mass.; Woonsocket Bobbin Company, Woonsocket, R. I.

Later the following companies were absorbed by the consolidation: T. J. Hale

Ccmpany, Lawrence, Mass.; John Parker, Lowell, Mass.; Joseph Hoyle Bobbin Company, Woonsocket, R. I.; Hambleton Bros., Goffstown, N. H.; Excelsior Bobbin & Spool Company, Newtown, Pa.

At present the main office of the U S Bobbin & Shuttle Company is located in Providence, R. I., while factories are located in Auburn, Maine; Manchester and Goffstown, New Hampshire; Lawrence, Lowell and Fall River, Massachusetts; Newtown, Pennsylvania; and Willoughby, Vermont. These mills employ about 1200 people altogether, the majority of whom are English speaking.

The officers of the company are Luther C. Baldwin, Providence, president; Frederic C. Church, Lowell, Mass., vice-president; and George H. Wilson, Providence, secretary and treasurer. Capitalization is \$1,500,000; annual turnover \$5,000,000; and percentage of increase in recent years about 50 per cent.

The products of the company include warp, filling, tripods, quills, speeders and slubbers, cap spinning, flax spinning and twister bobbins: warper, speeder and slubber skewers; comber, underclearer, drawing and winder rolls; moquette, drawing, warper, twister, jack, silk and belting spools and also shuttles for plain and automatic looms. The "S" shuttle for automatic looms, made by this company, is one of the most important products put on the market in recent years.

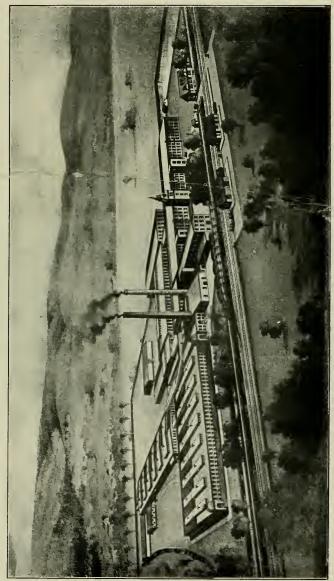
RENFREW MANUFACTURING CO.

The Renfrew Manufacturing Company has occupied an honorable place in the New England textile field since 1867, when it was organized under the laws of Massachusetts by James Renfrew, Levi L. Brown, James C. Chalmers and George H. Gilbert, with a capital stock of \$100,000. Indomitable perseverance and strict attention to business on the part of the initial pilots of the Company's affairs brought the enterprise out of the dark in the early days of struggling and established it upon a firm foundation. Throughout the years that have followed the high standards set by the founders have been scrupulously observed. Consistent pursuance of such a policy could not fail to bring its well deserved reward, and in the case of the Renfrew Company the reward has been of no mean proportions. This fact is attested by its handsome annual turnover and increasing business both throughout the United States and abroad.

The Renfrew Manufacturing Company had its beginning in the purchase of William Pollock & Company, who operated the Stone Mill, known as the Broadley Mill, which was built in 1845 by William Pollock, of Pittsfield. The firm of William Pollock & Company was composed of William Pollock, James Renfrew and James C. Chalmers.

William Pollock & Company had also purchased property and started the foundation of a mill on the west side of the Hoosac River, adjoining the tracks of the Boston & Albany Railroad, which is now the main property of the Renfrew Manufacturing Company at Adams, Mass. This was also part of the purchase of the Renfrew Company already referred to.

In conjunction with these mills, the Renfrew people also operated a spinning mill at Dalton, Mass., for a number of years.



Plant of the Renfrew Manufacturing Company, Adains, Massachusetts.

In 1881, the colored damask business was started by the building of the Jacquard Mill, near the center of Adams, the Turkey Red Dye House, on Dean street, and the spinning mill at Maple Grove. In recent years the Company has sold the Dalton, Dean street and Broadley Mill properties, so that now it is running the three main properties, known as the Main Property, the Jacquard Mill and the Maple Grove Mill.

The present equipment consists of 1992 looms and 36,000 spindles with dye house and finishing works making colored and bleach table damask and table cloths, ginghams, madras and colored wash goods and also colored and grey yarns. A force of 1300 workers is required to produce the output of Renfrew goods demanded by the trade. From the beginning sales have been made through commission houses in New York City, the present agents being F. U. Stearns & Company, of 9 Thomas street.

The officers of the Renfrew Manufacturing Company, from its establishment to the present time have been, in the order named, as follows:

Presidents—Levi L. Brown, of Adams; J. N. Dunham, of Pittsfield; Levi L. Brown, of Adams; William H. Hill, of Boston; and Donald M. Hill, of Boston. Vice-presidents—James C. Chalmers, Ernest L. Hill, James C. Chalmers, Francis U. Stearns. Treasurers—James C. Chalmers, Edward L. Wood, James Renfrew, L. Brown, Emil Kipper, Ernest L. Hill, Francis U. Stearns. Assistant Treasurers—Charles M. Sprague and Ira S. Ball.

The original capitalization has been increased to \$1,600,000, and judging from the record of achievement and calibre of the men who have helped to make it and are now at the helm, further expansion on a large scale would be no surprise to observers of events in the New England mill territory.

UNITED STATES BUNTING CO.

Bunting manufactured by the United States Bunting Co. continues to be of the same high standard for which it received an award at the Centennial at Philadelphia in 1876. An extensive exhibit was made of their fabric at that time, which attracted wide attention. During the World War the Company furnished the government by contract with many thousand pieces of bunting including a large amount for flags for warships.

The beginnings of this Company are particularly interesting. Previous to the year large quantities of this bunting for the flags.

Since the founding of the Company its business has spread widely, so that its product, which includes not only the specialty of wool bunting, but also worsted men's wear and dress goods, goes all over the United States, as well as to South America, Cuba, Mexico, and the Philippines. Some 650 are employed at the plant and the only disadvantages are the distances from the New York market and the coal supply.

The present officers are Andrew Marshall, president; George Stevens, vice-president



Weave Mill of United States Bunting Company, Lowell, Massachusetts

1865 all bunting for flags used on American vessels was made in England and it seemed high time that the cloth for the national emblem should be produced in this country. The United States Bunting Company was established in Lowell, Mass., that year by General Benjamin F. Butler, DeWitt C. Farrington, and Samuel Fay. A mill was soon in operation and samples submitted to Congress. In December, 1865, the United States Bureau of Navigation made tests of these samples, the result of which showed that the fabric made by the United States Bunting Company was superior to the English product. So the government bought

and general manager; and C. Brooks Stevens, treasurer. The directors are Andrew Marshall, Albert Ames, C. Brooks Stevens, and George Stevens, clerk of the board.

The equipment of the plant includes thirteen cards, twelve combs, 350 looms, 10,000 worsted spindles, 3,000 twister spindles, eight boilers, and two water wheels. The plant dyes and finishes. Their selling agents are H. and W. H. Lewis for the worsteds, and Turner Halsey Company for the bunting. The United States Bunting Company also owns the Walsh Worsted Mills, of Lowell, which manufacture worsted and woolen goods.

DURHAM HOSIERY MILLS

Four brothers and a double-first cousin are the men behind the guns in the \$6,000,-000 business of the great Durham Hosiery Mills of Durham, N. C.—Julian S. Carr, Jr., president; A. H. Carr, vice-president; C. McD. Carr, treasurer; and W. F. Carr, assistant treasurer and secretary. hosiery for men, women and children goes to the jobbing trade the world over, backed up by a quality guarantee that means just what it says. The Carrs always have been sticklers for "quality" and "service", but it is a third factor that makes the story of what they have done and are now doing one of more than ordinary interest. This third factor deserves to be read heedfully by all other large employers of workers, for it has to do with that vital properties of which getting the "human nature." is a way of Julian S. Carr founded the Dur-

markar Julian S. Carr founded the Durham hosiery business twenty years ago, and the real Carr story harks back to the days when his son Julian S. Carr, Jr., took charge of the first small mill at Durham. It was from this insignificant start that the present corporation grew. It is capitalized at \$10,000,000, operates eleven mills and employs 3,500 persons, the predominating national-

ity being American.

Julian S. Carr, Jr., learned the first great lesson in the handling of men when he took hold as boss of the works. It taught him the fallacy of the doctrine, not yet extinct, and dying hard, that business is of necessity a purely selfish institution; it was driven home to him that such a doctrine was far more likely to bear evil fruit than good results. His eyes were opened to this realization through the medium of a "paste jewel", as he later called the man.

He hailed from Pawtucket; he knew all there was to know about the knitting industry—everything. In short, he was a worldbeater bar none, and didn't care much who knew it. Mr. Carr was badly in need of the services of a superintendent at this early stage in his career, and he took on the plausible stranger. It was a fateful step and

an almost calamitous one.

111

Whether or not the "glittering jewel" was all he said he was Mr. Carr did not have the time to find out, for he was plunged head first into a situation from which he was compelled to extricate himself with the utmost celerity or suffer the alternative of disastrous consequences. As may be surmised, the process involved the hasty departure of the new superintendent from the Carr mill. The severance of relations was effected none too soon, for never in his born days, says Mr. Carr, has he come in contact with an individual possessed of such a highly developed faculty of antagonizing a working organization; in fact, it was so perfect that had it been a virtue instead of a Having saved the millis experience. He saw that here was a law other than that of the land which demanded respect-the law of human nature. He never had been inclined to the pitiless policy with which so many businesses have floundered upon the rocks; if anything he had leaned strongly the other way, though common sense told him the "happy medium," so generally commended in all things, was to be desired most of all; no mawkish sentiments of course, but a certain regard, nevertheless, for the feelings of men beyond a hard and

work. Then and there he resolved to make the Carr business conspicuously human. For nineteen years now he has been working along this line, and the results are eminently satisfactory to both the company and the workers in the factories. The latter are helped to help themselves, not in any paternal fashion but in practical form. There are houses leased very cheaply to employees, better houses than they could rent elsewhere for the price; visiting nurses for the sick; a fund for loans and emergency purchases; motion picture shows, a baseball team for the young fellows, etc. The private office door is always open to an employee who comes with a suggestion, and the reward is unfailing if it is one for the

fast rule of a fair day's wage for a fair day's

betterment of the business.

The whole idea boiled down is a manto-man proposition: "You give us a square deal and we will give you the same." And it works.

The Carrs don't go outside for their executives, superintendents, foremen and sub-foremen, they take them from the ranks. The lesson taught by the gentleman from Pawtucket is fresh in their minds. They have made it a cast iron rule to get people who "fit," as in the case of C. D. Partin, for instance. Partin, the son of a neighboring farmer, was the assistant superintendent at the time of the Pawtucket incident. He was likable and naturally bright, but without any great technical knowledge. But the Carrs took a chance on him and put him in the other man's shoes. It proved to be a wise move, for Partin brought order out of chaos in that critical period-and the technical knowledge came in due time. Today he is the general superintendent of all the Durham mills.

There is another psychological consideration that has figured largely in the making of the Carr family spirit: it was told not long ago by Julian S. Carr, Jr., in an article which he wrote for a magazine devoted to business.

"We had been making goods on order the they were sold under whatever name product was need to put on them—our quality, we never knosiery. We stressed pass, but there was nothing to bad goods might point and say, "This is our pick we We felt it would not be possible for the worker to take a real pride in anything

which was not distinctive—the family did not stand for anything. Then why not make our product stand for something?

"From out of that reasoning came the trade-mark 'Durable Durhain.' We put it on everything that bore our name—factory signs, wagons, notices to the force. Finally we made it the emblem of employment. Every executive, every superintendent now wears a button containing the trade-mark—we wear them always and everywhere. The other day the old watchman, who wears the trade-mark on his sleeve, pointing to the emblem, said to me, 'A man's got to live up to that around here.' That is the spirit we are after in every way that we know. I think that we are succeeding."

The Carrs are going on the principle that the worker who wears the trade-mark emblem of the Durham Hosiery Mills feels that it is an unsaid pledge that the wearer will not stand for second grade merchandise and that, therefore, he will strive to live up to the standards of first grade manhood.

Viewed on the whole, the Carrs think that they have the human equation very nearly right. "For after all," again borrowing the well said words of President Carr, "it is the people, not the machinery, that make the goods. Four walls, a roof and a lot of knitting machines will not turn out hosiery. Put people at those machines and they will produce hosiery; but it takes the right people to make the right hosiery."

The right people and the human equa-Carlo There is a sermon in that, and the





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A Plant of the Textile Finishing Machinery Company

HISTORY OF THE TEXTILE FINISHING MACHINERY CO.

The Textile-Finishing Machinery Company, a Rhode Island corporation, was incorporated on October 1, 1902, to take over and operate the plants formerly owned by the Granger Foundry & Machine Company, Providence; the Rusden Machine Company of Warren, R. I.; Thomas Phillips Colary & of Providence; and the Phoenixe, K. I.

Machine Company of Prompany are: Mr. The officers of president; Mr. William R. Tilling Sast, vice-president; Mr. Charles H. Newell, secretary; and Mr. Henry A.

Du Villard, treasurer.

The four Companies above mentioned were all engaged in a similar line of business, namely that of building, bleaching, mercerizing, dyeing, drying, printing and finishing machinery for piece goods, warps and yarn and this business has been successfully cotinued ever since. Some years later the build go of extensive additions to the two Pridence plants into wich most of the machiery was moved from the Rusden Machin. moved from the Rusden Machine Company and the Phoenix Foundry & usiness nearer pany plants, thus bringing the

to the executive offices which are locater of 83 Exchange place in the busin

the city of Providence wno was the founder Mr. E. A Machine Company, and was of thirty, for seventeen years, with the wellknown manufacturers of this same class of machinery, the Mather & Platt Company of Manchester, England, became general manager of the present Company and still holds that position, in addition to being the presiden.

The Company's product is well known to all rurchasers of finishing machinery in the Unted States and Canada and is finding an

stensive market abroad.

During the years of the war, the works were run night and day part of the time, producing one of their specialties which was dyeing machinery for khaki cloth, needed for the clothing urgently of our soldiers. In addition to this, for machining heavy guns were made for the numerous heavy gun parts, and fixtures government arsenal at Watervliet, N. Y. Tons of aluminum were melted up in the foundry and manufactured into molds used



MAIN OFFICE AND WORKS, PROVIDENCE, R. I.

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Another Plant of the Textile Finishing Machinery Company

in the making of gas masks; great quantities of copper piping were made for steam-ships, the word other items too numerous to menemployees beart of the Textile's and its war. Twenty-eight a towards winning the served in various branches examilisted and both at home and abroad and in sice, ranks from colonel to private.

One of the most interesting processes which their works will show is the manufacture of calender rolls. Here can be seen enormous hydraulic presses in which these rolls are made from compressed paper, cotton, corn husks, or cotton and corn husks mixed, this latter being the company's patented "Combination" calender roll. pressure is so great that the cotton or other material, when finally ready for finishing, is hard, and special tools have been manufactured for finishing these rolls to make them ready for use in the calendering machines for finishing cloth, which are built in endless variety. This Company is the largest manufacturer of calender rolls in the world. The employees number approximately four hundred.

During the last three years large shipments have been made of their products to foreign

countries, including India, Japan, Italy, France, Spain, Portugal, Brazil, Argentina, and even to England.

The illustrations show one view of each of the two extensive plants, both of which are located within the city limits of Providence. During the last few years both of these plants have been re-equipped, and now have matrice tools and appliances of the latest pethese plants used in their business. Each of and each one a been completely electrified tric generating set work steamy driven electronishing all the necessary lighting and power for operating the traveling cranes which are used for carrying the heavy parts from one part of the shop to another.

Some idea of the great variety of machines outly by the Textile can be gained from a general list of purposes for which the products o this Company are used. Complete equipments are built for bleaching, mercerzing, drang, dyeing, printing, and finishing piece good of every description. Machinery s also mulactured for the complete pleaching an finishing of wide sheeting and lamask, crock, and other bed quilts as well as complete of the dyeing, finishing and printing of the bleaching and fin-

ishing of toweling, both linen and cotton, and every description of white goods, from the finest lawns to the heaviest duck.

Machines are produced for the finishing of knitted silk glove and underwear cloth; for finished tapes and braids, and elastic webbing of every description; the bleaching and finishing of lace curtains, and all descriptions of embroidery goods. Complete outfits of machinery are also made for dyeing all kinds of warps and yarns, one specialty being the manufacture of complete outfits for indigo warp-dyeing. The mercerization of warps has been taken up very consistently. The first warp mercerizing machines made in the United States were constructed by this Company, and since then these machines have

been developed so that the yarn goes in at one end and comes out completely mercerized and dried, ready for winding, at the other end of the machine.

Cylinder drying machines are made in all sizes, from the smallest, to the largest cylinder which can be used. Some of these are made as large as 150 inch face and nine feet in diameter. During the last few years, the automobile industry has greatly increased the need of imitation leather and rubberized goods for tops, and this Company manufactures numerous machines for coating, embossing, and finishing these classes of goods. In other words, the Company is in a position to furnish any machine required to do any of the above referred to processes on any kind of cloth, warp, or yarn.

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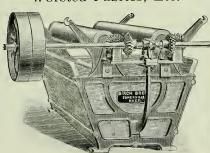


Coronation' Piece-End Sewing Machine

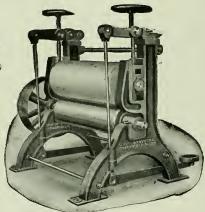
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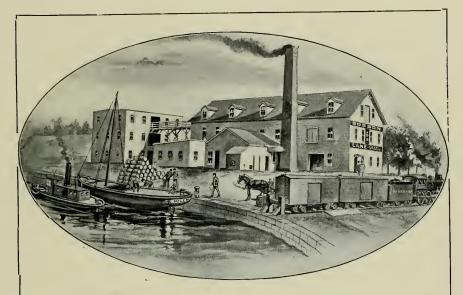
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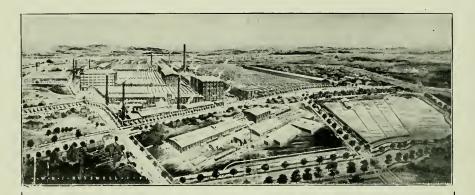
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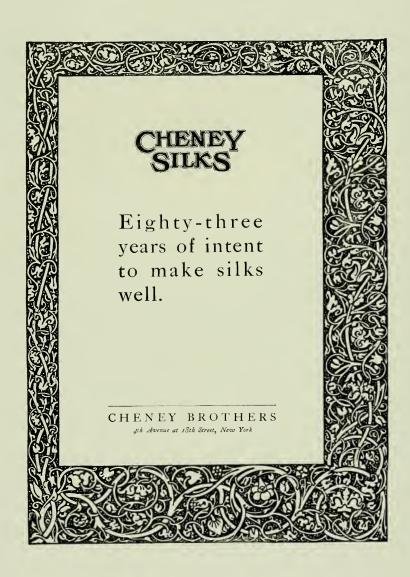
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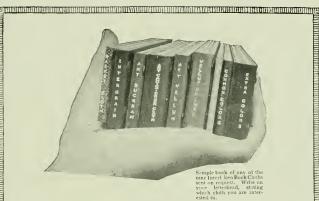
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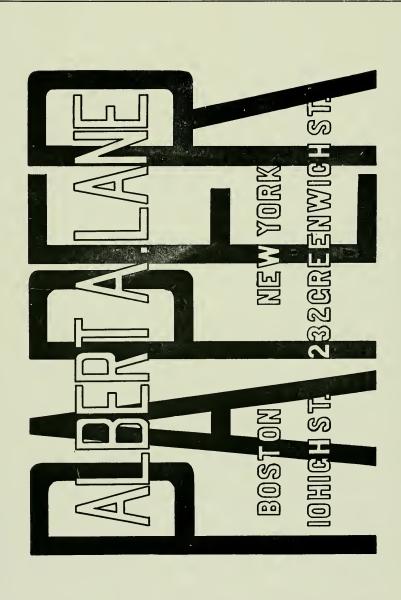
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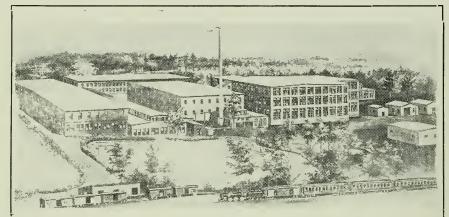
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"Khaki", speaking of the word, is derived from the British Indian word "Khak", meaning dust. Khaki—the fabric—was created in India during the Indian mutiny as the most suitable color for the army as the color blended with the Indian sand colored dust or soil and rendered the soldiers practically invisible at a distance. They used a "Khaki" colored drill or twill principally.

Now however any drill or twill irrespective of its color, whether the original khaki color or even any shade between black and white be it brown, green, grey, olive, or other shade is called by the trade a "Khaki Drill" and as stated above it is getting even more popular.

There is of course, as usual in such cases, numerous imitations of khaki drills, colors can be produced with cheap dyes and the cloth when first manufactured has the appearance of "Real Khaki" but the colors begin to fade as soon as the garments are exposed to the sun and laundered and the advice to use "Real Khaki—not imitation" is obviously good advice to follow.

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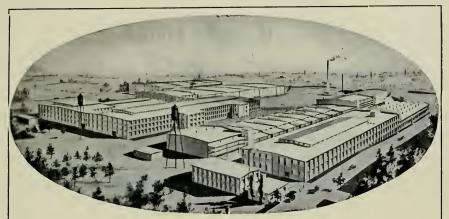
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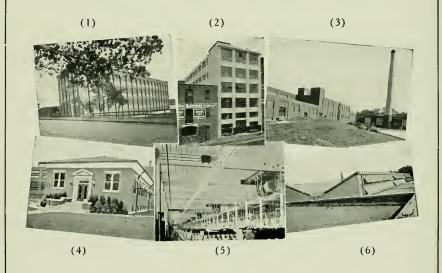
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INDEX

	Page	D	Page
Ackerman, Foster & Parsons	140	Blodgett, Hon. Samuel	46
Aiken Mills, Bath, S. C	172	Boott Cotton Mills in 1852, Lowell,	
Almy & Co., William	369	Mass.	50
American Bleached Goods Company	176	Bosson & Lane	373
American Mutual Liability Insurance		Boston Manufacturing Co., Waltham,	
Company	141	Mass	29
American Pulley Company	356	Botany Worsted Mills	3/4
American Woolen Company	133	Brighton Mills	157
Amory, Browne & Company	173	Brown Co., David, Lawrence, Mass	264
Amory, William	35	Brown, Moses	61
Amoskeag Manufacturing Co.,		Butterworth, Harry W	198
Manchester, N. H		Butterworth, Henry W	198
Counting Room	67	Butterworth, James	198
Mill Yard Scene	45	Butterworth, John	198
Panoramic View of Plant	44	Butterworth & Sons Co., H. W., Phila.,	170
Old Bell Mill	33	Pa.	
	79	Original Factory and Advertising	199
Old Foundry			7 7 7
Amory Mill	129	Butterworth & Sons Company, H. W.	198
Coolidge Mill	81	Butterworth-Judson Corp., Newark,	1.40
Amoskeag Falls and Plant in		N. J	149
1856	17		
Andrews Mills Co., Branch Village,		Campbell & Co., John, Newark, N. J.	358
R. I	269	Campbell & Co., Trademark, John	358
Arabol Manufacturing Co., Brooklyn,		Campbell, John	358
N. Y	145	Cards	
Arnold, Hoffman & Co., Inc	393	The Davis & Furber	207
Arnstaedt & Co	385	The Scholfield	207
Atlas Color Works	146	Carpet	
Augusta Knitting Corporation	370	Axminster	. 97
Avon Mills Company, Lewiston, Me	146	Axminster Chenille	98
, , , , , , , , , , , , , , , , , , ,		Brussels	96
Ballard Vale Mills	150	Ingrain	99
Bancroft & Sons Company, Jos.,	150	Tapes'ry	96
Wilmington, Dela.	181		97
Banner Silk Knitting Mills, Inc.,	101	Velvet	
Brooklyn, N. Y.	153	Wilton	96
Barbour Flax Spinning Co		Catlin & Co	375
Parton Street Stint C	371	Chase & Company, L. C	164
Bates-Street Shirt Co	424	Chelsea Fibre Mills, Brooklyn, N. Y.	217
Bayer, E. S	320	Cheney Brothers, So. Manchester,	
Bell, Hussey & Brown	156	Conn	376
Bigelow, Erastus B	91	City Manufacturing Corporation	377
Bigelow-Hartford Carpet Co.		Claffins, Inc., N. Y. City	144
Weaving Mills, Clinton, Mass	142	Clark, Frederic S	302
Mills, Thompsonville, Conn	143	Cleveland Worsted Mills, Cleveland,	- 52
Bigney, Charles Ira	267	Ohio	219
Birch Brothers	372	Coal, Chart of Products derived from	110
Birch & Son, John W	419	Cohen, Barnett	245

	Page		Page
Coley, Harry C	170	Fairhaven Mills, New Bedford,	
Color Service Corporation	298	Mass	381
Columbia Mills	422	Fales & Jenks Machine Company	258
Cone, Ceasar	213	Farr Alpaca Co., Holyoke, Mass. 340,	343
Cone Export & Commission Company	212	Farwell Bleachery	382
Cone, Moses H	212	Fish, Charles H	232
Converse & Company	147	Forney & Co., Inc	383
Cotton Exchange			
Present N. Y. Building	57	C C LL W . L MUL C C L L	
	59	Garfield Worsted Mills, Garfield,	215
Proposed N. Y. Building	60	N. J	
New Orleans, La		Georgi, Carl	298
Cranston Print Works, Cranston, R. I.	306	Gledhill, Eli	384
Curran & Barry	160	Glenside Woolen Mills	385
		Goff, D. L.—Goff & Sons, D.,	
Dana Warp Mills	353	Pawtucket, R. l	332
Danvers Bleachery, Peabody, Mass	349	Goodall Worsted Co., Sanford, Me	336
Dartmouth Manufacturing Corporation,		Grasselli Chemical Co., The	386
The	226	Graves, Frank B	208
Davis & Furber Machine Co.,		Graves Co., Frank B.	
North Andover, Mass	206	Office, Albany, N. Y	208
Davis, George Gilbert	206	Mill, Cohoes, N. Y	209
Deering, Milliken & Co., Inc	378	Storehouse, Cohoes, N. Y	209
		Greene, Arthur Duncan	211
Dery, D. George	161	Griffith, A. Clinton	244
Dicks, David Company		Griswoldville Manufacturing Co.,	277
Doherty Silk Company, Henry	240		222
Dunker & Perkins Co	379	Griswoldville, Mass	222
Dunlop's Sons, John, N. Y. & Penn.			
Mills	225	H. & B. American Machine Co.,	
Du Pont Laboratory, Deepwater Point,		Pawtucket, R. I	169
N. J 254,	255	Hamilton Woolen Co., Southbridge,	
Durham Hosiery Mills	364	Mass	231
Durham Hosiery Mills Trademark	365	Harding, Tilton & Company	304
Duren & Sons, Geo. B	394	Harding, Tilton & Company	JU4
Dusenbury Worsted Mills, Inc	422	Harding, Tilton & Co., Mills	305
Dusenbury & Co., Inc., Louis	422	represented by	
Duval & Co., W. H		Harris Oil Company, A. W	210
Dwight Mill, Chicopee, Mass	76	Harris, A. Walter	210
Dwight Min, Cheopee, Mass	, 0	Haywood, T. Holt	345
Ell M C C		Haywood Department of Frederick,	
Eddystone Manufacturing Company,	2.41	Vietor & Achelis, T. Holt	345
The	241	Hetherington & Sons Ltd., John	420
Eiseman, A. S	245	Heywood, Geo. F	210
Eisemann & Company, Inc., Samuel	244	Hinman, Arthur M	261
Eiseman & Co., Inc., Samuel, Office of,		Hinman Corporation, A. M	260
N. Y. City	246	Hird, Samuel	201
Eiseman, Samuel	245	Hird & Sons, Inc., Samuel	201
Eisner Company, Sigmund	162	Hodges, Chas. E	141
Eisner, Sigmund	162	Hodgson, George H	219
Emerson Laboratory			387
Emery & Beers Company, Inc	163	Holmes Manufacturing Co	
Emery, Joseph H	163	Holyoke Plush Co., Holyoke, Mass	165
English & Co	380	Hopping, A. Howard	410
Esmond Mills, Esmond, R. I		Hotchkin & Company	328
Everett, Heaney & Company, Inc	243		
	243	Conn.	158
Exeter Manufacturing Co., Exeter &	215	Howard, Charles M	250
Pittsfield, N. H 314,	212	Howard Bros. Mfg. Co	170
		Hug & Company, L. F	159
Fales & Jenks Machine Co., Pawtucket,		Hunter Manufacturing and Commission	
R. I	258	Company	166

	Page		Page
Innis, Speiden & Company	344	Manchester Print Works, Manchester,	
Interlaken Mills	388	N. H	121
Isco Chemical Co., Inc., Niagara Falls,		Manchester, N. H., in 1855	65
N. Y	344	Manville Co	394
		Marsden, Phillips B	170
Jackson, Patrick Tracy	31	Merchants Manufacturing Co	395
Juilliard & Company, A. D	262	Meritas Mills	399
jumara a company, in 2000 to 1000		Metcalf, Joseph	341
Kaltenbach & Stephens, Inc.,		Metcalf, Manton B	289
	317	Metz & Company, Inc., H. A	174
Allentown, Pa	389	Metz, Col. Herman A	175
Kaplan & Co., B. D		Meyer, Sol	244
Kaumagraph Company	154	Mianus Manufacturing Company	228
Kayser & Co., Julius, Brooklyn, N. Y.	320	Midgley, Herbert	171
Kayser, Julius	320	Migel, J. A.	397
Kent, George E	314	Miller Aniline & Chemical Co., Inc.,	271
Kilburn, Lincoln Machine Company	223	When Annue & Chemical Co., Inc.,	398
Kilburn Mill	390	Wm. T	271
Klipstein, Augustus	347	Mill & Cill C	
Klipstein & Co., A., N. Y. City	346	Mills & Gibb Corporation	271
Knox Woolen Co., Camden, Me	313	Mindlin & Rosenman	257
Kuttroff, Pickhardt & Co., Inc	391	Minot, Hooper & Company	216
		Mitchell Company, James E	155
I am - Albant A	392	Mobile Cotton Mills	399
Lane, Albert A	256	Mohawk Carpet Mills, Inc.,	
Lane, J. H		Amsterdam, N. Y	
Lane & Company, J. H	256	McCleary, Wallin & Crouse Plant	194
Lanett Cotton Mills	316	Mohawk Valley Cap Factory, Utica,	
Langley & Company, J. H	172	N. Y 310,	312
Langley Mills, Langley, S. C	172	Montgomery Co., l. R., Windsor	
Langshaw, Walter H	226	Locks, Conn	237
Lawrence, Amos Adams	133	McComb Cotton Mills	399
Lawrence, Mass., Panoramic view	51	McGilvery-Cummings Co	423
Lawrence, Mass., in the 50's	. 53	McKenney & Company, H. P	196
Leeson, Joseph R	354	McLean Company, Andrew	220
Lewis, John D	422	McLoughlin, John E	310
Lewiston, Me., Panoramic view	63		311
Libbey Co., W. S	417	McLoughlin, R. P	423
Lockwood, Greene & Company	247	Mt. Vernon-Woodberry Mills, Inc.,	423
Looms		D-12 M.	102
Automatic Northrop	39	Baltimore, Md	193
Chenille Axminster	95	Mystic Manufacturing Co	384
Old style hand—American and	,,,		
Oriental	90	National Aniline & Chemical Co	203
Lowell, Francis Cabot	13	Office N. Y. City	204
Lorraine Manufacturing Co	420	Dye Works	205
		National Silk Dyeing Company	192
Lowe, Donald & Co	42.1	Naumkeag Steam Cotton Co., Salem,	194
Lowell Bleachery	321	M	348
Jowell, Mass., in 1825	47	Mass	
Lowell Mills, Lowell, Mass., Early		Neild Manufacturing Corporation	168
View	27	Neuss, Hesslein & Company	277
Lowinson, Louis	330	New Bedford Storage Warehouse	~~=
		Company	337
Mackintosh, William H	196	New England Waste Co., Revere	
Main, Charles T	322	Mass 325,	401
Mallinson & Company, H. R	290	Newmarket Mfg. Co., Newmarket,	
Mallinson, H. R	291	N. H 244,	402
Manhasset Mfg. Company	211	Niagara Electro Chemical Co., Niagara	
Manchester Mill, Old, Manchester,		Falls, N. Y	186
N. H	88		
		North Adams Manufacturing Company	176
	427		

	Page		Pag:
O'Brien & Co., J. H Old Colony Woolen Mills Co	403	Sloane, W. & J Southern Cotton Mills & Commission	282
Pacific Mills, In 1860	4.2	Company, Inc	191 11
In 1860	43 335	Spinning and weaving in "Days Gone By"	21
Columbia, S. C	335	Springdale Mills	396
Cotton Dept., Lawrence, Mass	333	Springer, Fred A	228
Print Works, Lawrence, Mass	334 334	Stafford, Oliver M	218 400
Worsted Dept., Lawrence, Mas. Falmer, J. Ben	404	Standard Textile Products Co399, Standish Worsted Co., The	411
Parkhill Manufacturing Co	405	State Pier, New Bedford, Mass.	711
Park Spring Dyeing and Bleaching Co.		Exterior view	338
Parsons, Theophilus	49	Interior view	339
Passaic Print Works, Passaic, N. J	202	Unloading cotton	338
Passaic Worsted Spinning Company .	295	Stephenson Manufacturing Company .	265
Pels Co., Inc., Frank F	242	Sterling Color Co., Inc	412
Perry & Whipple	406	Stevens, John A Stevens & Company, J. P	272 300
Perth Amboy, N. J	187	Stevens & Sons Co., M. T., Original	300
Pfeiffer & Co., Geo. H	422	Mill at Andover, Mass	30.
Piscataquis Woolen Co., Guilford, Me.		Stoney & Starkey, Inc	423
Ponemah Mills, Taftville, Conn	176	Storage Warehouses	
Poor, J. Harper	173	Unloading Cotton	337
Princeton Worsted Mills	407	North Stores, New Bedford, Mass.	339
Proctor & Schwartz, Inc 281,	408	Terminal Stores, New Bedford,	220
Pulleys, American Steel Split	357	Mass.	339
Putnam-Hooker Company	266	Straw, Hon. Ezekiel A	48 413
Renfrew Manufacturing Co., Adams,		Suncook Mills	248
Mass	361	Surpass Chemical Company	293
Ring & Sen, Inc., Jonathan	409	Susquehanna Silk Mills	324
Rockfall Woolen Co., Middletown,		Sussex Print Works	184
Conn	246	Talkat Milla	202
Roessler & Hasslacher Chemical Company, The	186	Talbot Mills	302 297
	100	Tate Electrolytic Textile Processes, Inc.	2),
Sanford Mills, Sanford, Me., and	17.4	In operation	307
Reading, Mass	164 329	Original Waterproofing Machine.	308
Schnabel Brothers	180	Taylor, Armitage & Eagles, Inc	414
Schoen Silk Corporation, Carl	296	Terminal Wharf & Railroad	100
Selden Worsted Mills, The	410	Warehouse Co., Boston, Mass Terry, Benjamin S	189 210
Selig, A. L	245	Textile Finishing Machinery Co.,	210
Selma Cotton Mills	399	Providence, R. I	366
Seydel Manufacturing Company, The.	381	Townsend & Company, E. M	288
Siegelé, Curt. G	298 353	Troy Blanket Mills, Troy, N. Y	165
Silberstein & Son, S.	353	Turner, Halsey Company	193
Simpson, W. P.	241	Trainor Co., The John F	423
Skinner & Sons, Wm., Holyoke, Mass.		Union Mills, Inc. of N. Y. State	195
Mills	252	U. S. Bobbin & Shuttle Co	359
Trademark	253	U. S. Bunting Co., Lowell, Mass.,	
Slater & Sons, Inc., S	352	Weaving Mill	363
Sloane, William, Original factory, N. Y. City	283	United States Color and Chemical	124
Sloane, William	282	Co., Inc	424
Sloane, William, page from first	202	Universal Winding Co., So. Auburn, R. l	355
ledger	284	Utica Knitting Co., Utica, N. Y	294
	428		

	Page		Page
Victoria Mills, Thornton, R. I	188	West Boylston Manufacturing Co.,	
Viscose Co., Marcus Hook, Pa. &		Easthampton, Mass274, 275,	276
Roanoke, Va	286	West Point Manufacturing Company .	350
Vogel, H. H	245	Whittemore, Edward A	159
		Winchester Woolen Co	416
Wamsutta Mills	318	Windsor Print Works, No. Adams,	
Watts & Company, Ridley		Mass 249,	
Weaving and Spinning in "Days Gone		Willey & Co., Francis	
By"	21	Whitman & Son, Inc., Clarence	
Weaving of Blanket by American		Wolff, A. C	
Indian	15	Wood, Wm. M.	
Webb, Sons Co., Chas. J., Phila., Pa	326	Woodward, Baldwin & Company	185
Weidman Silk Dyeing Co., Paterson,		Worumbo Manufacturing Co., Lisbon	100
N. J	280	Falls, Me	
Weil, Walter		Wright's Underwear Co., Inc 393,	419
West, Baker & Company	309	Wyandotte Worsted Co	418













